

Project Numbers	M121/15 & M121/34	
Project Title	Fertiliser monitoring	
Project Manager	W Deale	
Co-workers	Internal	AA Nel, SC Swanepoel
	External	FSSA & Grain SA

Final abstract

Fertiliser and lime quality is of utmost importance for optimum fertilisation of crops and fair-trading. Quality standards for fertiliser and lime are specified in Act Number 36 of 1947. This project, which started in 2006/07 and continued until 2011/12, was a continuation of a project that started in 2000/01 with protocol agreed on between the FSSA and Grain SA. The aim of this project was to evaluate granular fertiliser and lime after delivery and liquid fertiliser prior to delivery according to standards set out by legislation.

For FSSA members, between 5 and 10 % of the nitrogen, 0 and 17 % of the phosphorus and 0 and 12 % of the potassium containing fertilisers had contents lower than the permissible deficits annually. For non-FSSA members, element contents lower than the permissible deficit were found in two out of four seasons. In these two seasons, 7 - 17 % of the nitrogen, 15 - 23 % of the phosphorus and 11 - 67 % of the potassium containing fertilisers, were lower than the permissible deficits.

Forty-two % of the 19 standard calcitic limes complied with the 1700 µm particle size requirement, while all met the 250 µm requirements. Ninety-five % of these limes met the Mg content requirement while 74 % complied with the CCE requirement.

Seventy-three % of the 22 standard dolomitic limes complied with the 1700 µm and 95 % with the 250 µm particle size requirement. All standard dolomitic limes complied with the Mg content and CCE requirements. The two micro fine dolomitic limes monitored met all requirements.

Keywords: Fertiliser, lime, quality

Introduction

Fertiliser and lime quality is of utmost importance for optimum fertilisation of crops and fair-trading. Quality standards for fertiliser and lime are specified in Act Number 36 of 1947. This project was a continuation of a project that ended in 2005/06, with a revised protocol agreed on between the FSSA and Grain SA. The aim of this project was to evaluate fertiliser according to standards set out by legislation.

Materials & methods

Fertiliser sampling points in the maize producing area were randomly selected or on request from farmers. Farm supplied granular fertilisers were sampled in the presence of a representative appointed by the company concerned. Specific sampling procedures were followed and specialised equipment used during sampling, splitting and sealing of samples. Liquid fertilisers (12 sub-samples) were taken at the plant from tankers destined to farmers. Samples of chemically compounded and bulk blended fertiliser granular mixtures were split by a sample splitter and divided into twelve sub-samples and sealed in clearly marked tins. Three independent laboratories each received three of the sub-samples for analyses and the three remaining sub-samples were provided to the company's representative.

After receiving results from the three laboratories, means were calculated for each element after discarding statistically significant outliers. Mean element values (N, P and K) were compared with the quality standards of Act 36 of 1947 and the results provided to Grain SA, the farmers and fertiliser companies involved. Permissible deficits (percentage deviation) of elements (N, P and K) in mixtures are determined by means of a sliding scale. Lower concentrations of elements permit higher deficits and vice versa.

At least five different lime sources were sampled from 2006/07 to 2011/12 annually after farm delivery. Monitoring points were selected randomly or on request. Two sub-samples from each lime source were sent to two independent laboratories. The physical (particle size) and chemical quality properties of lime stipulated in ACT 36 of 1947 were applied to the results.

On disagreement on the quality compliance of the two samples analysed, a third sample was sent to a third independent laboratory. If the third subsample complied with regulations, the noncompliant analysis was discarded. Mean values from the two compliant samples were calculated and reported to Grain SA, the farmers and lime suppliers involved. If the analysis from the third sample showed that the lime sample was noncompliant, the compliant analysis was discarded and the means were calculated from the remaining two noncompliant samples and the results reported.

Regulations regarding standard lime determine that 100 % particles must be <1700 µm and 50 % <250 µm. In the case of micro fine lime 95 % of particles must be <250 µm and 80 % <106 µm. The permissible deficit of fineness is 7 %. For both types of lime the calcium carbonate equivalent {CCE(HCl)} must be a minimum of 70 %.

Annually within financial limits, the aim was to evaluate 50 fertilisers and lime from at least five different sources. The majority of fertiliser samples (90 %) were taken from FSSA members and the remainder (10 %) from non-FSSA members and the results were reported accordingly. Fertilisers were sampled from non-FSSA member companies since 2008/09.

Results: Fertiliser

FSSA members

From the 313 samples from FSSA members evaluated during this project period, 97 % contained nitrogen, 93 % phosphorus and 72 % potassium (Table 1). Annually between 77 and 94 % were granular, and the remainder liquid samples.

From five to 10 % of the nitrogen containing fertilisers annually evaluated, had contents lower than the permissible deficit (Table 3) with no clear increase or decrease trend over time. Nitrogen contents deviated from -6.1 to -24.3 %.

Of the phosphorus containing fertiliser, between 2 and 17 % had contents lower than the permissible deficit (Table 3) from 2006/07 to 2010/11 with no clear increase or decrease trend over time. Deficits ranged from eight to -38.7 %.

From 10 to 12 % of potassium containing fertilisers evaluated from 2006/07 to 2009/10 had contents lower than the permissible deficit (Table 3). Deficits ranged from -6.9 to -40.6 %.

Noticeable, however is that requirements were met for fertilisers containing P in 2011/12, and K in 2010/11 and 2011/12.

The number of fertilisers and range of N, P and K deviations, higher than registered content, can be seen in Table 4.

Non-FSSA members

From the 38 samples from non-FSSA members evaluated during this project period, 89 % contained nitrogen, 87 % phosphorus and 53 % potassium (Table 2). Product types are shown in Table 2.

The permissible deficits were exceeded in 2008/09 and 2011/12 only (Table 5). In these two seasons, 7 and 17% of nitrogen, 15 and 23 % phosphorus and 11 and 67 % of potassium containing fertilisers were lower than the permissible deficits.

Nitrogen deviations ranged from -6.95 to -63.5 %, phosphorus from -7.8 to -62.2 % and potassium from -12.2 to -50.6 %. The extreme deviations, for all three elements, were from one granular fertiliser mixture.

Number of fertilisers and range of N, P and K deviations higher than registered content across all types of fertilisers analysed from 2008/2009 to 2011/2012 for non-FSSA members are shown in Table 6.

Results: lime

Nineteen standard calcitic limes were analysed from 2006/07 to 2011/12 (Table 7). Forty-two percent of these limes complied with the 1700 µm particle size requirement, while all met the 250 µm requirements. Ninety-five percent of these limes met the Mg content requirement while 74 % complied with the CCE requirement.

Twenty-two standard dolomitic limes were analysed from 2006/07 to 2011/12 (Table 7). Seventy-three percent complied with the 1700 µm and 95 % with the 250 µm particle size requirement. All standard dolomitic limes complied with the Mg content and CCE requirements.

Two micro fine dolomitic limes were monitored in 2009/10, and one in 2010/11. These met all the requirements (Table 7).

Table 1 Number of fertiliser products and elements analysed from 2006/07 to 2011/12 for FSSA member companies

Product	Number of fertilisers	N	P	K
2006/07				
Chemical*	3	3	3	2
Bulk*	39	39	38	32
Liquid	7	7	7	2
Total	49	49	48	36
2007/08				
Chemical	7	7	6	3
Bulk	31	31	30	25
Liquid	12	12	10	6
Total	50	50	46	34
2008/09				
Chemical	20	19	19	12
Bulk	35	33	33	28
Liquid	10	10	10	10
Total	65	62	62	50
2009/10				
Chemical	19	19	19	12
Bulk	22	22	21	12
Liquid	7	6	4	5
Total	48	47	44	29
2010/11				
Chemical	8	8	7	4
Bulk	32	31	31	26
Liquid	11	10	11	9
Total	51	49	49	39
2011/12				
Chemical	7	6	6	3
Bulk	33	31	29	26
Liquid	10	10	8	8
Total	50	47	43	37
Total	313	304	292	225

*Granular

Table 2 Number of elements in fertiliser products analysed from 2008/09 to 2011/12 for non-FSSA members

Product	Number of fertilisers	N	P	K
2008/09				
Chemical*	5	4	4	1
Bulk*	7	7	6	5
Liquid	3	3	3	3
Total	15	14	13	9
2009/10				
Chemical	0	0	0	0
Bulk	2	2	2	1
Liquid	1	1	0	0
Total	3	3	2	1
2010/11				
Chemical	3	3	2	1
Bulk	3	2	3	3
Liquid	0	0	0	0
Total	6	5	5	4
2011/12				
Chemical	3	3	2	0
Bulk	8	6	8	4
Liquid	3	3	3	2
Total	14	12	13	6
Total	38	34	33	20

*Granular

Table 3 Number of fertilisers and range of N, P and K deviations exceeding the permissible deficit across all types of fertilisers analysed from 2006/07 to 2011/12 for FSSA members

Season	N			P			K		
	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)
2006/07	49	3 (6%)	-8 to -20	48	4 (8%)	-8 to -15	36	4 (11%)	-8 to -12
2007/08	50	5 (10%)	-6.3 to -14.7	46	1 (2%)	-8.3	34	4 (12%)	-7.3 to -19.9
2008/09	48	3 (6%)	-7.5 to -9.8	49	5 (10%)	-8.9 to -15.6	41	4 (10%)	-7.8 to -15.4
2009/10	44	3 (7%)	-6.1 to -11.1	42	7 (17%)	-7.7 to -38.7	28	3 (11%)	-6.9 to -40.6
2010/11	44	2 (5%)	-7.6 to -24.3	44	2 (5%)	-8.4 to -17.4	35	None	-
2011/12	35	2 (6%)	-8.3 to -10.1	33	None	-	31	None	-

* Number of fertilisers exceeding the permissible deficit (percentage of total).

Table 4 Number of fertilisers and range of N, P and K deviations higher than registered content across all types of fertilisers analysed from 2006/2007 to 2011/2012 for FSSA members

Season	N			P			K		
	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)
2006/07	49	28 (57%)	0.33 to 36.54	48	29 (60%)	0.58 to 19.83	36	24 (67%)	0.23 to 48.66
2007/08	50	21 (42%)	0.21 to 41.94	46	33 (72%)	0.12 to 30.7	34	25 (74%)	0.38 to 45.29
2008/09	48	28 (58%)	0.17 to 29.15	49	30 (61%)	0.07 to 24.42	41	27 (66%)	0.25 to 43.27
2009/10	44	30 (68%)	0.1 to 54.9	42	20 (48%)	0.37 to 9.54	28	19 (68%)	0.33 to 29.5
2010/11	44	29 (66%)	0.7 to 13.2	44	26 (59%)	0.63 to 37.5	35	28 (80%)	0.45 to 34.2
2011/12	35	21 (60%)	0.9 to 20.6	33	20 (61%)	0.20 to 32.3	31	24 (77%)	0.30 to 29.8

* Number of fertilisers higher than registered content (percentage of total).

Table 5 Number of fertilisers and range of N, P and K deviations exceeding the permissible deficit across all types of fertilisers analysed from 2008/09 to 2011/12 for non-FSSA members

Season	N			P			K		
	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)
2008/09	14	1 (7%)	-6.94	13	3 (23%)	-7.8 to -23.29	9	1 (11%)	-12.2
2009/10	3	None	-	2	None	-	1	None	-
2010/11	4	None	-	3	None	-	2	None	-
2011/12	12	2 (17%)	-8.3 to -63.5	13	2 (15%)	-12.8 to -62.2	6	4 (67%)	-13 to -50.6

* Number of fertilisers exceeding the permissible deficit (percentage of total).

Table 6 Number of fertilisers and range of N, P and K deviations higher than registered content across all types of fertilisers analysed from 2008/2009 to 2011/2012 for non-FSSA members

Season	N			P			K		
	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)	Number of fertilisers analysed	*	Range of deviation (%)
2008/09	14	8 (57%)	0.72 to 12.55	13	8 (62%)	0.11 to 9.9	9	4 (44%)	0.45 to 22.62
2009/10	3	2 (66%)	2.4 to 3.8	2	None	-	1	1 (100%)	6.91
2010/11	4	2 (50%)	2.4 to 3.8	3	None	-	2	2 (100%)	1.74 to 6.91
2011/12	12	6 (50%)	0.45 to 22.96	13	6 (46%)	0.56 to 15.96	6	1 (17%)	1.94

* Number of fertilisers higher than registered content (percentage of total).

Table 7 Number of compliant limes per lime type from 2006/07 to 20011/12

Product	Season					
	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Standard calcitic	Out of 4	Out of 4	Out of 5	Out of 1	Out of 3	Out of 2
Particle size						
1700µm	2	1	2	0	2	1
250µm	4	4	5	1	3	2
Mg (%)	4	4	5	1	3	1
CCE (HCl)	2	3	4	0	3	2
Standard dolomitic	Out of 4	Out of 3	Out of 4	Out of 4	Out of 3	Out of 4
Particle size						
1700µm	3	3	3	2	3	2
250µm	4	3	4	3	3	4
Mg (%)	4	3	4	4	3	4
CCE (HCl)	4	3	4	4	3	4
Micro fine dolomitic	None	None	None	Out of 1	Out of 1	None
Particle size						
250µm				1	1	
106µm				1	1	
Mg (%)				1	1	
CCE (HCl)				1	1	

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