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THE FERTILITY STATUS OF LAND IN THE UTHUKELA DISTRICT AFTER THE IMPLEMENTATION OF A LIMING AND SOIL FERTILITY PROGRAMME

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KWAZULU- NATAL DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT

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INTRODUCTION

Phosphorus deficiency is the soil fertility constraint most widely observed in KwaZulu-Natal, but severe soil acidity and K deficiency are also found in many soils. Because of this, widespread success in crop production is unlikely unless effective use of fertilizer occurs (Manson 1996).

In 2011 and 2012 the KZN Department of Agriculture and Rural Development appointed two service providers to supply, deliver and incorporate lime and fertilizer on communal lands in the province. The incorporation involved spreading, discing and ploughing on the land.

Lime is incorporated to reduce soil acidity and improve the uptake of nutrients such as phosphorus and nitrogen by plant roots. The application of both lime and fertilizer was aimed at improving soil fertility for better crop production in communal lands.

OBJECTIVES

The objective of this study was to compare the soil fertility status of communal lands before and after implementation of the programme. The study was undertaken in the uThukela district.

METHODS

Samples were taken randomly from different fields in the uThukela district in 2013 after the completion of the Liming and Fertility programme. Of these only three sites did not have pre - liming and fertility test results i.e. Hlathikhulu, eMaHlutshini and KwaDlamini (indicated as post-liming projects on Map 1). GPS coordinates were taken for all samples and the sizes of fields measured. Pre- liming and fertility sampling is indicated as time 1 and post- liming and fertility sampling is indicated as time 2 in the graphs.

Crops grown

The dominant crops grown in these fields are maize and dry beans. They are planted under dryland conditions.

RESULTS AND DISCUSSION

<u>Bergville</u>

Phosphorus (P)

Phosphorus requirement is determined as follows:

P Recommendation (kg/ha) = (Target P – soil P) x PRF.

The target P test is the minimum P test required in the soil under consideration for optimum growth of the indicated crop. It depends on both the texture of the soil, which is estimated using sample density and on the crop to be grown. PRF = Phosphorus requirement factor. Soil P is measured phosphorus. Target P value (sample density 1 g/ml) for maize is 12 mg/L. Target P value (sample density 1 g/ml) for dry beans is 10 mg/L.

Figure 1 indicates that when the target P values for maize and dry beans were considered, only four fields were found to have sufficient P before the liming and soil fertility programme since the P tests were above 10mg/l. After the programme, only three fields had sufficient P for production of maize or dry beans. Thus the amount of P applied on the sampled fields did not change the fertility status significantly. P in these soils is still far below target P for maize and dry bean production.

Potassium (K)

Potassium fertilizer requirement is calculated to raise the soil K test to the target K level of the crop to be fertilized. It is assumed that 2.5kg K is required to raise the soil K test by 1 mg/L where K is applied and incorporated into the soil. The following equation is therefore used.

Recommended K (kg/ha) = ("Target K" - soil K) x 2.5

All sampled fields in Bergville (Figure 2) had high K status (above 100 mg/L), which is sufficient for most row crops. Only three fields received additional K.

Soil acidity

Permissible acid saturation for maize is 20% and that for dry beans is 5%. Bergville fields (Figure 3) had lime applied across all sampled fields.

Zinc (Zn)

Zn-containing fertilizer is recommended where soil Zn is less than 1.5 mg/L.

Most of the fields have sufficient Zn levels (Figure 4).

<u>**Estcourt**</u>

Phosphorus

Figure 5 indicates that most fields in Estcourt required application of P fertilizer. Initial P readings showed that only 20% of fields had sufficient P prior to P application, while post programme tests showed that 60% of fields had sufficient P for crop production. The programme was a success in Estcourt, rendering more hectares of cropping land more fertile.

Potassium

Estcourt fields (Figure 6) received K applications as dictated by their initial K status and K fertilizer recommendations (as explained earlier).

Soil acidity

Fewer fields were limed in Estcourt (Figure 7).

Zinc

Zn levels (Figure 8) were variable with some fields having high Zn levels, whilst others were relatively low in Zn.

Loskop

Phosphorus

In Loskop, most fields received applications of P fertilizer, as shown by the higher time 2 readings compared to time 1 readings (Figure 9). The programme increased P levels in all fields, but only three fields had sufficient levels of P to support optimum production of maize and dry beans.

Potassium

Figure 10 indicates that in spite of K fertilizer additions, K levels remained low in some fields.

Soil acidity

Lime was applied to a reasonable level for maize production (Figure 11).

Zinc

Only one field in Loskop had Zn above 1.5 mg/L (Figure 12).

Winterton

Phosphorus

Figure 13 shows that only 50% of the fields in Winterton received P. However, the incorporated P did not raise the soil P levels to reach the target values for production of maize and dry beans.

Potassium

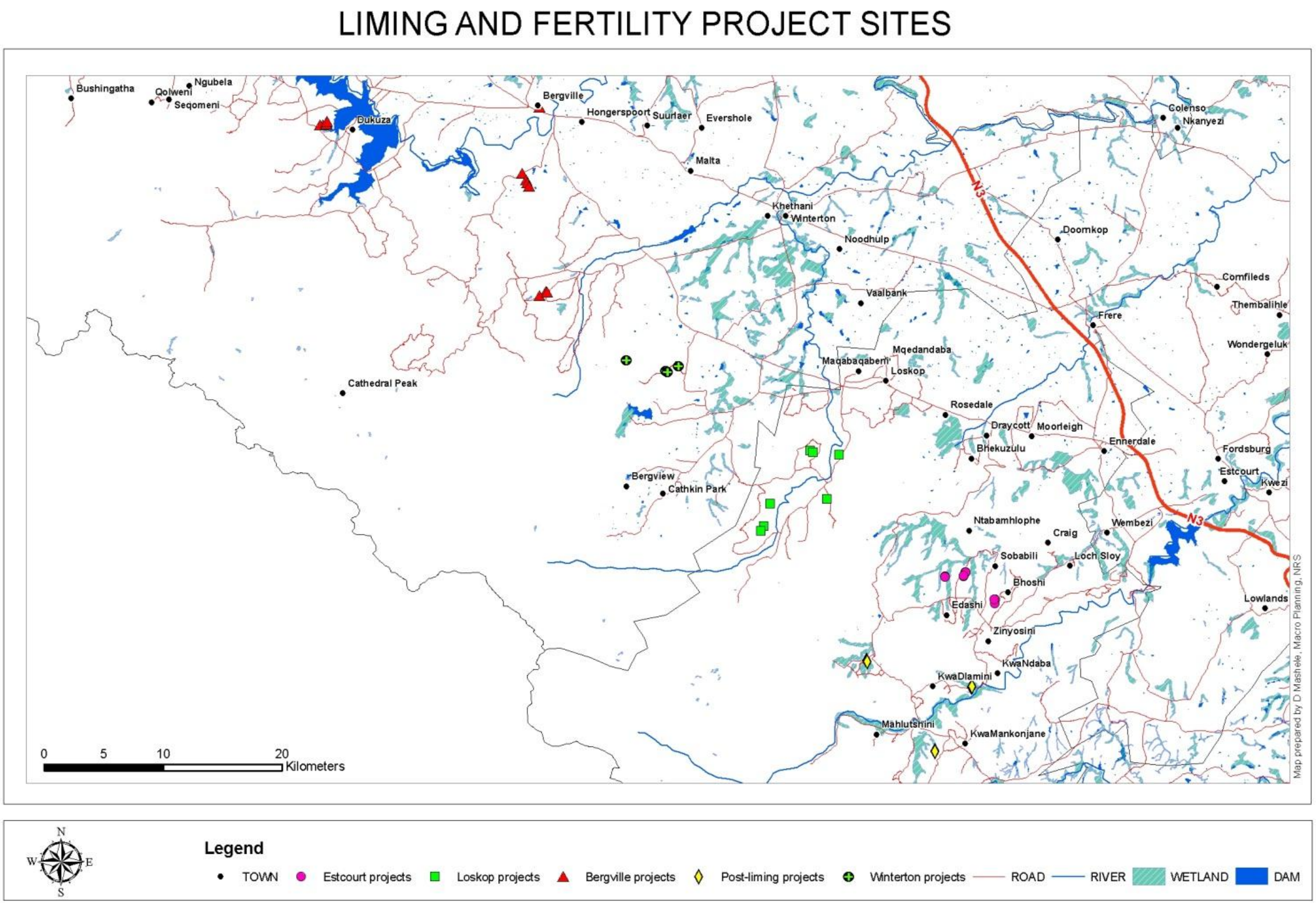
Figure 14 indicates that the sampled soils in Winterton generally had sufficient K, except for one which had K applied to above 100 mg/L.

Soil acidity

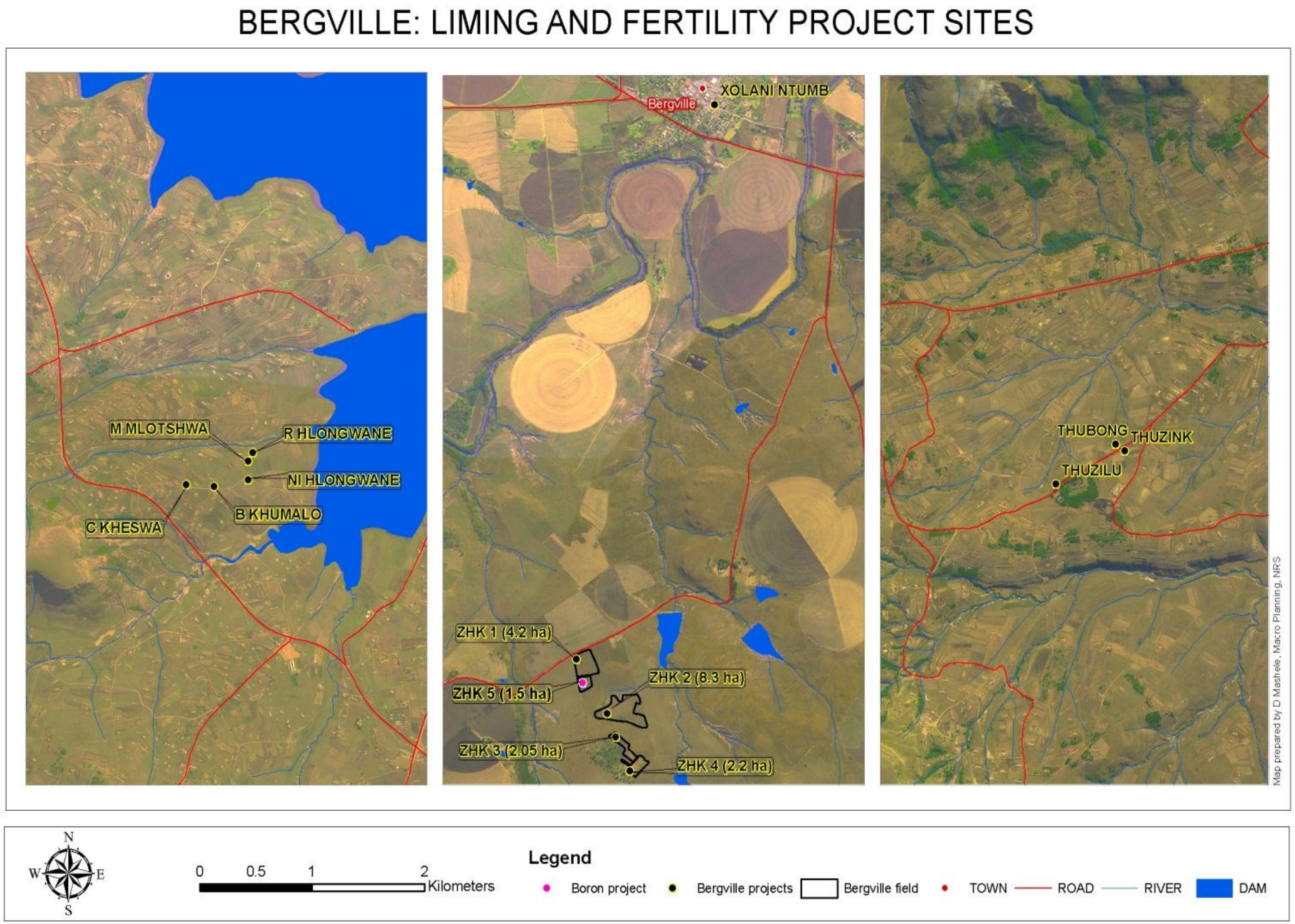
In Winterton (Figure 15) sampled fields that had acid saturation well below PAS for maize did not have lime applied.

Zinc

Figure 16 indicates that the fields in the Winterton area had sufficient Zn levels for optimum maize and dry bean production.



Map 1. Sampled sites of uThukela district



Map 2. Sampled Bergville fields

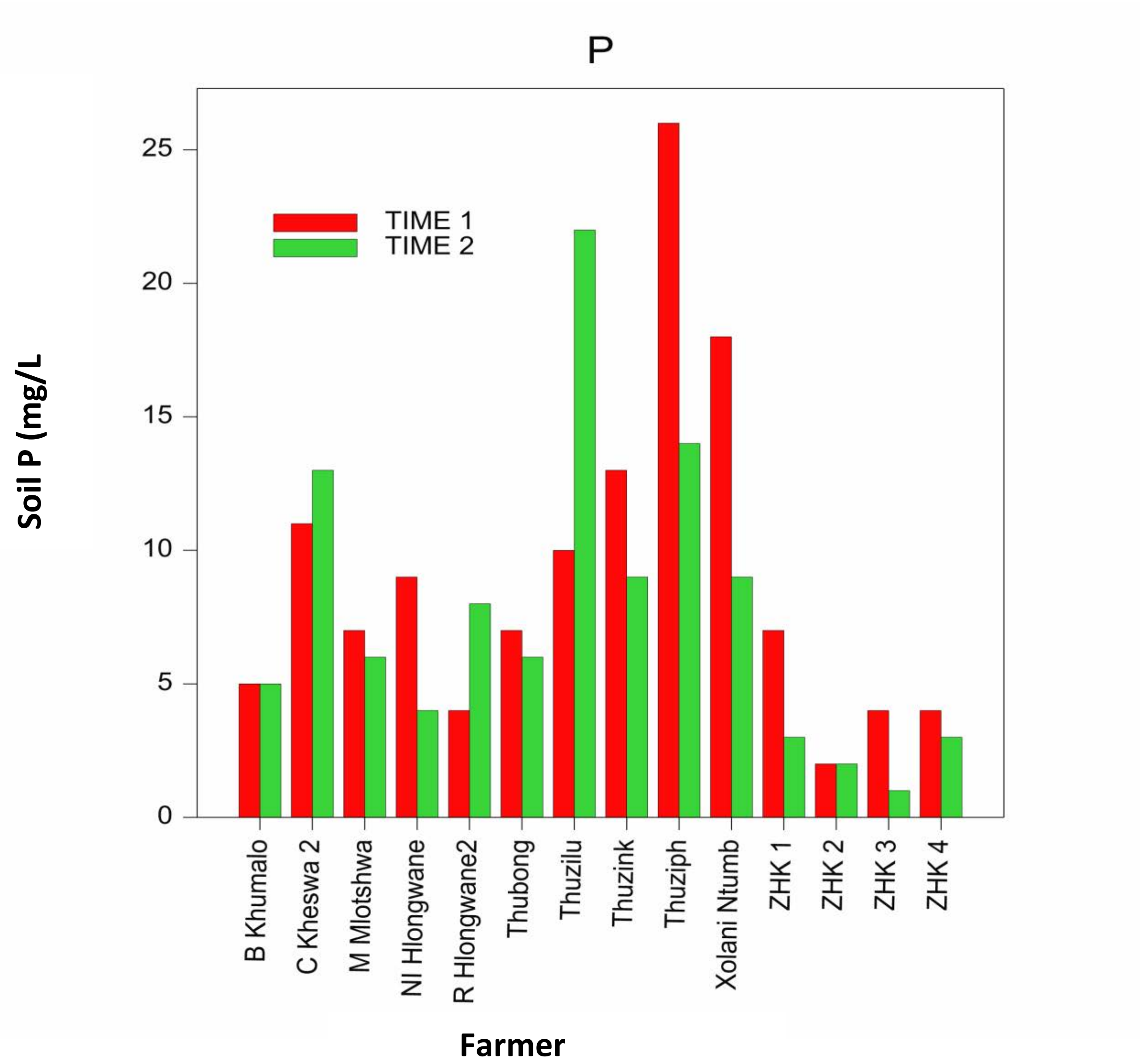


Figure1. Soil P values of samples from Bergville

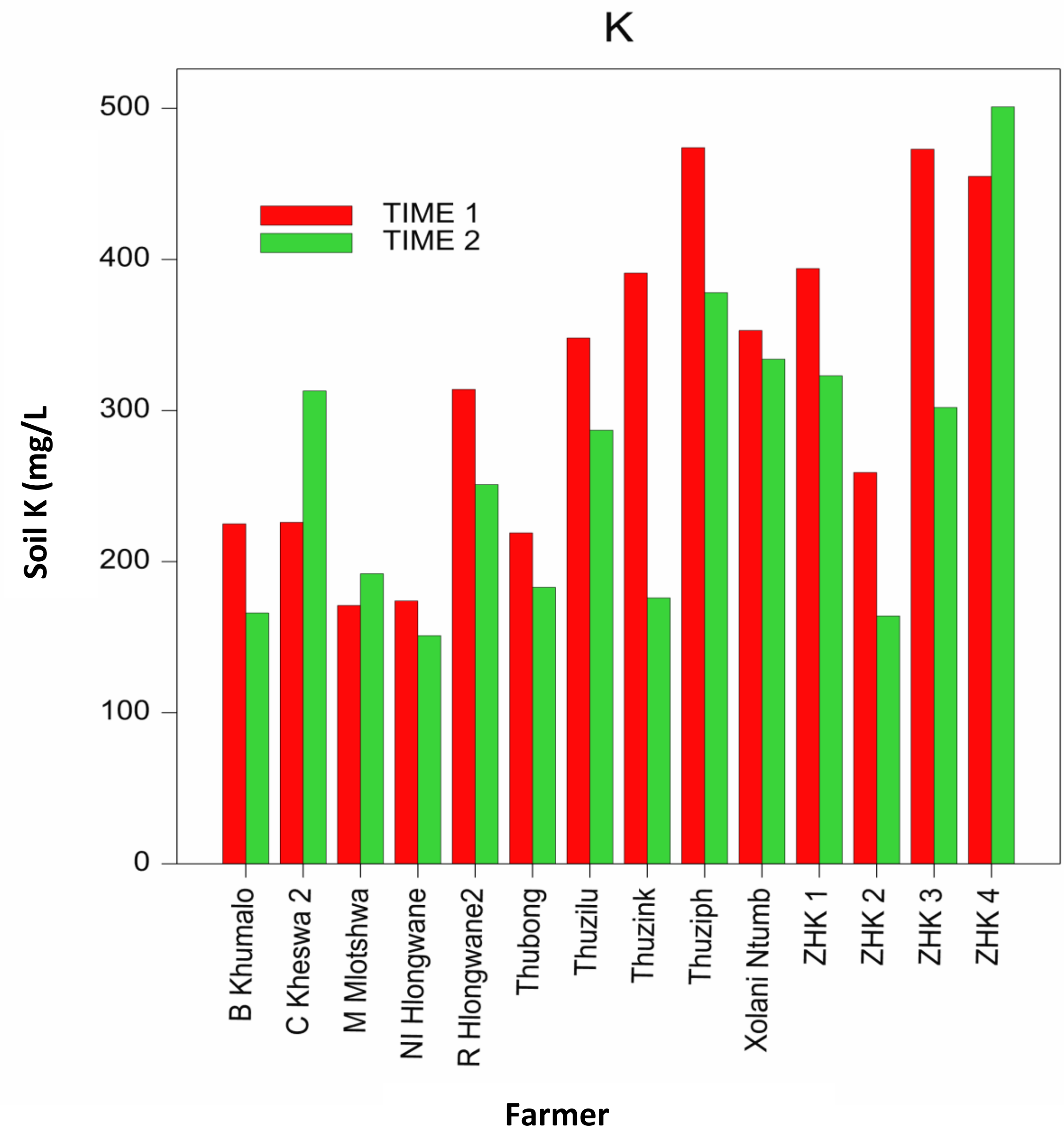


Figure 2. Soil K values of samples from Bergville

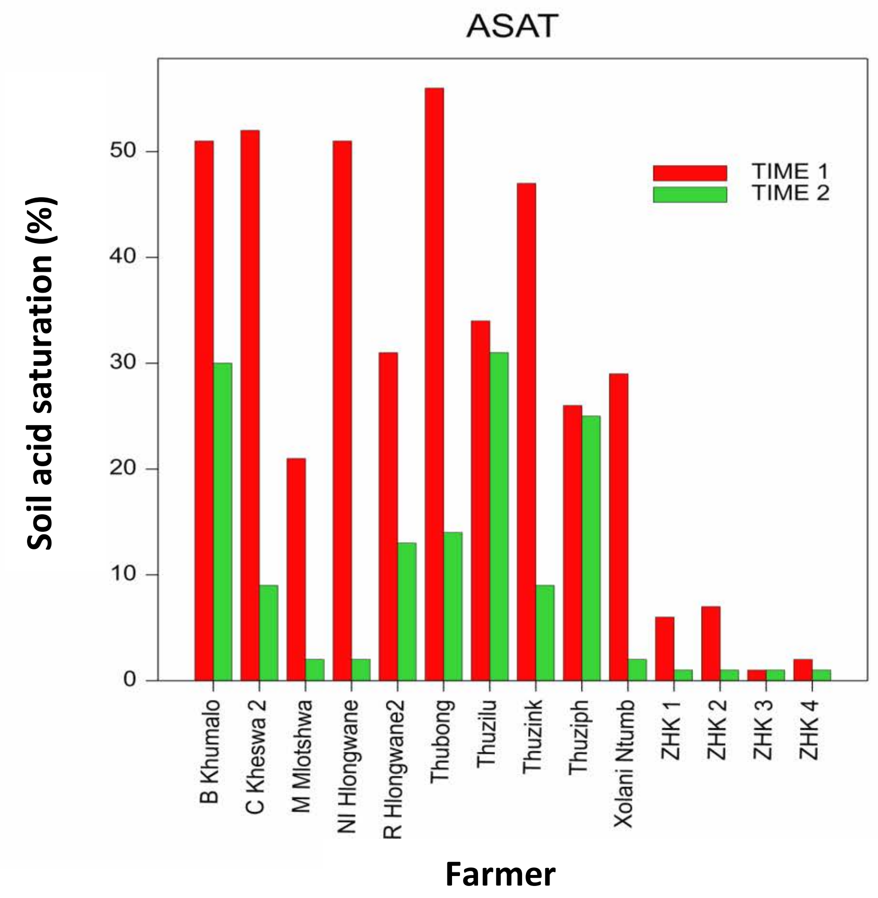


Figure 3. Soil acid saturation values of samples from Bergville

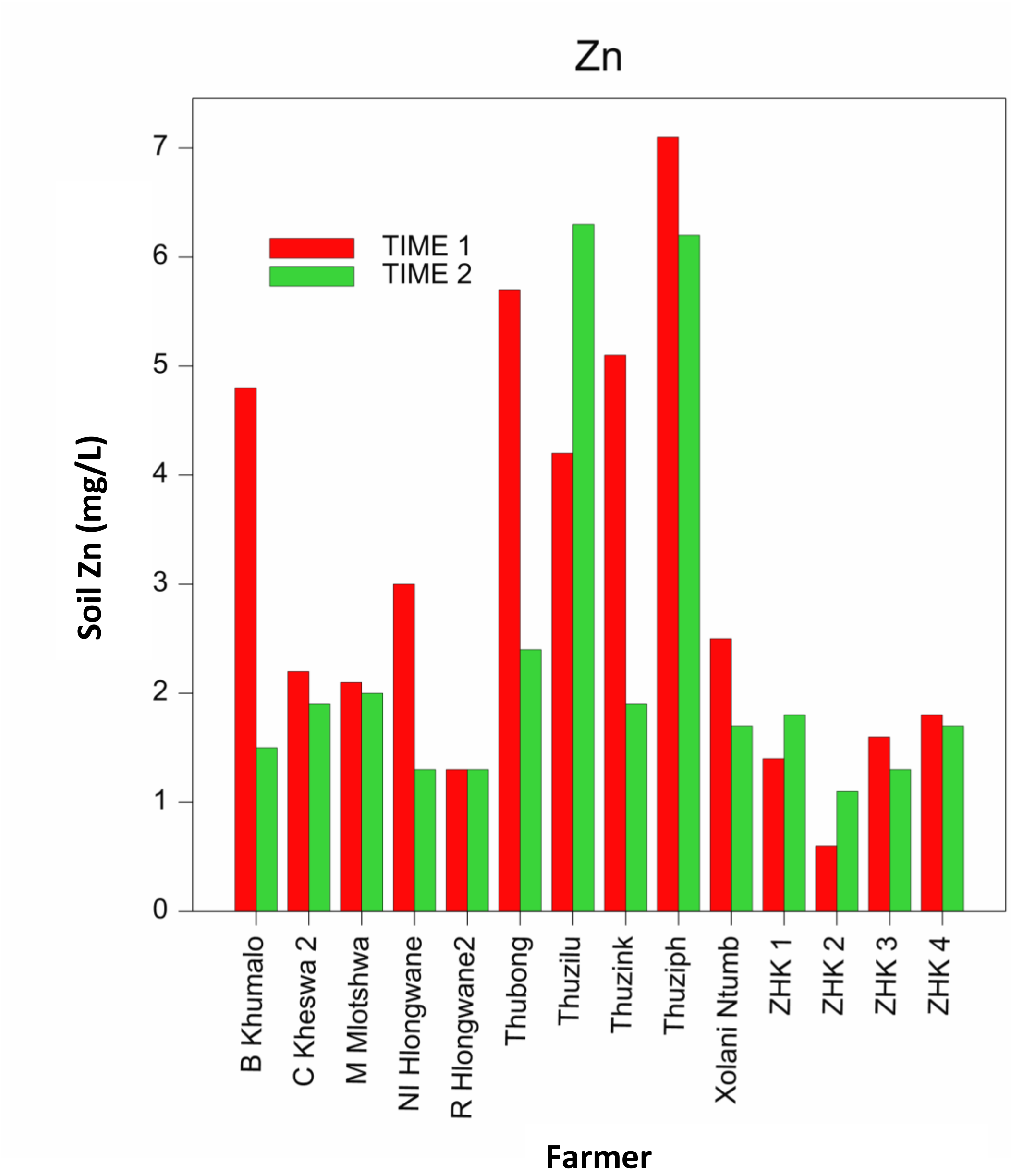
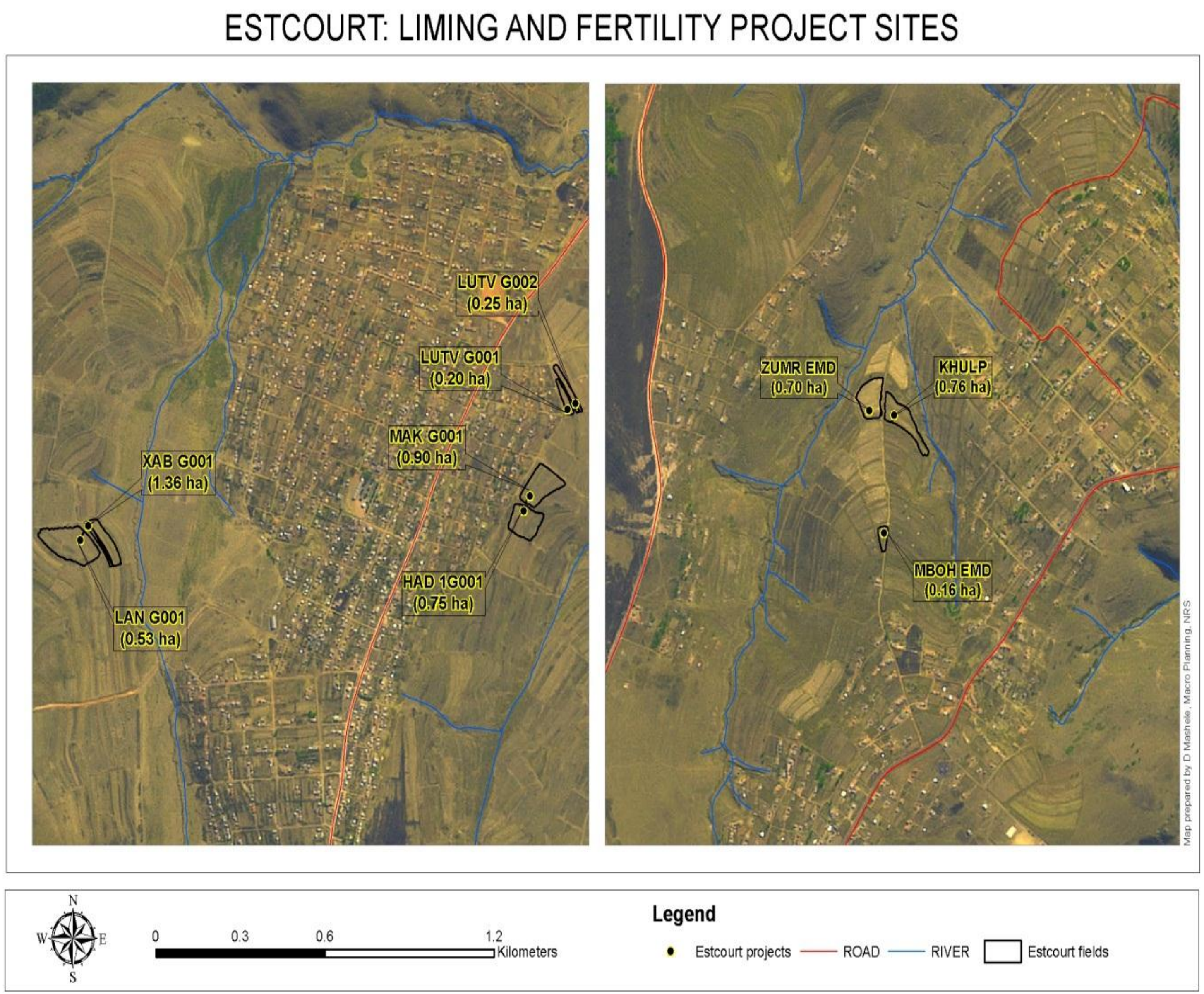


Figure 4. Soil Zn values of samples from Bergville



Map 3. Sampled Escourt fields

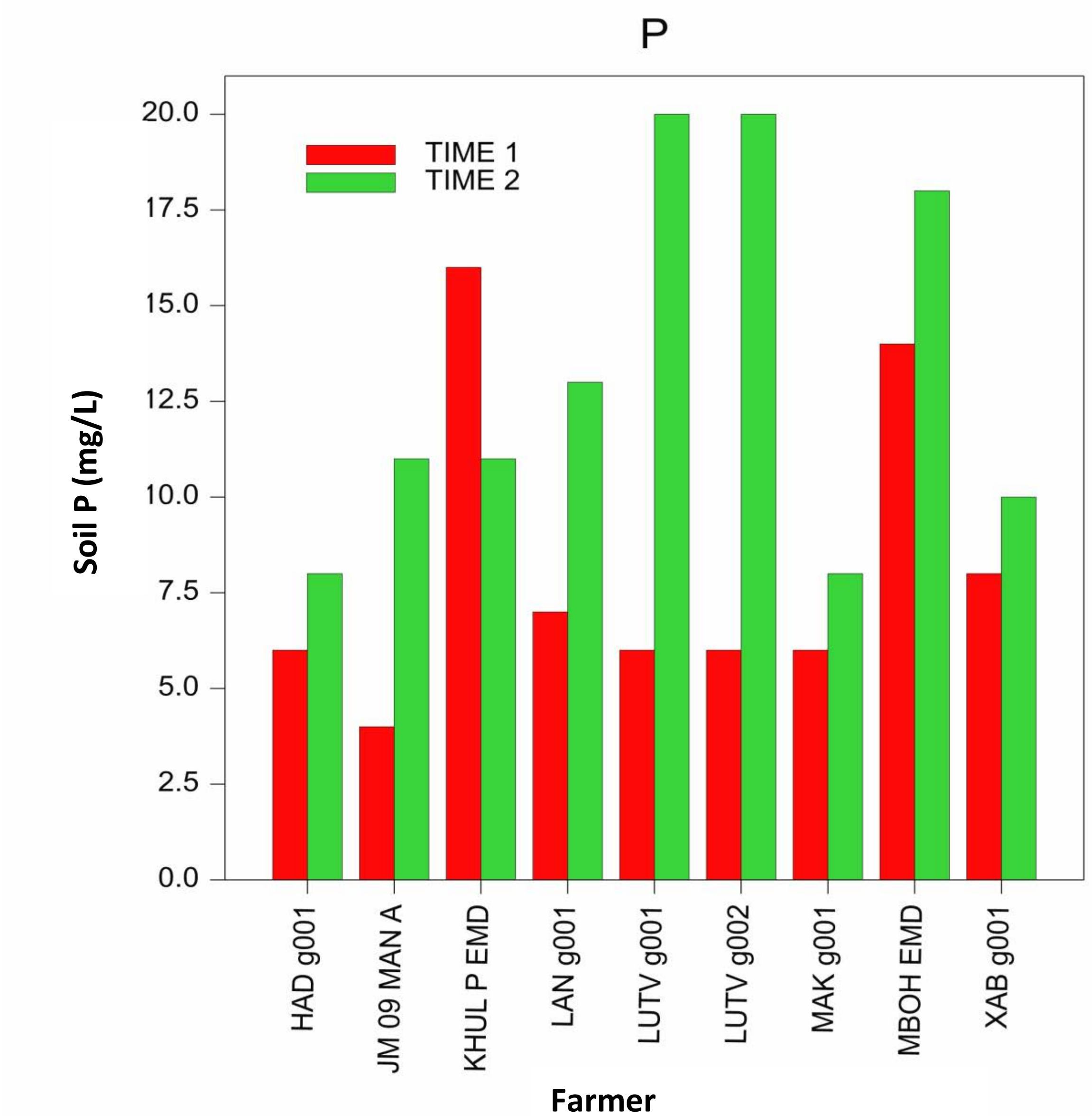


Figure 5. Soil P values of samples from Estcourt

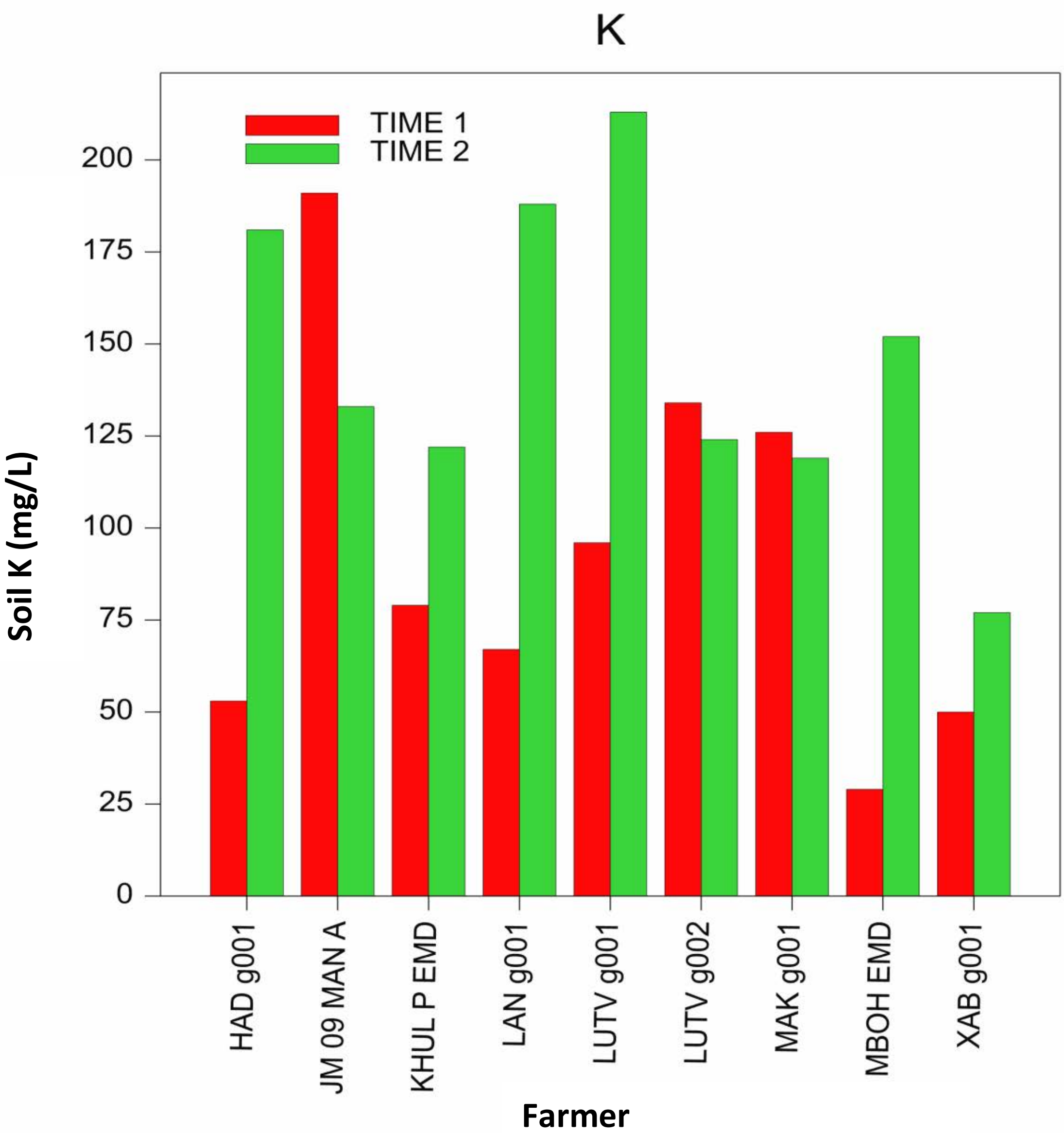


Figure 6. Soil K values of samples from Estcourt

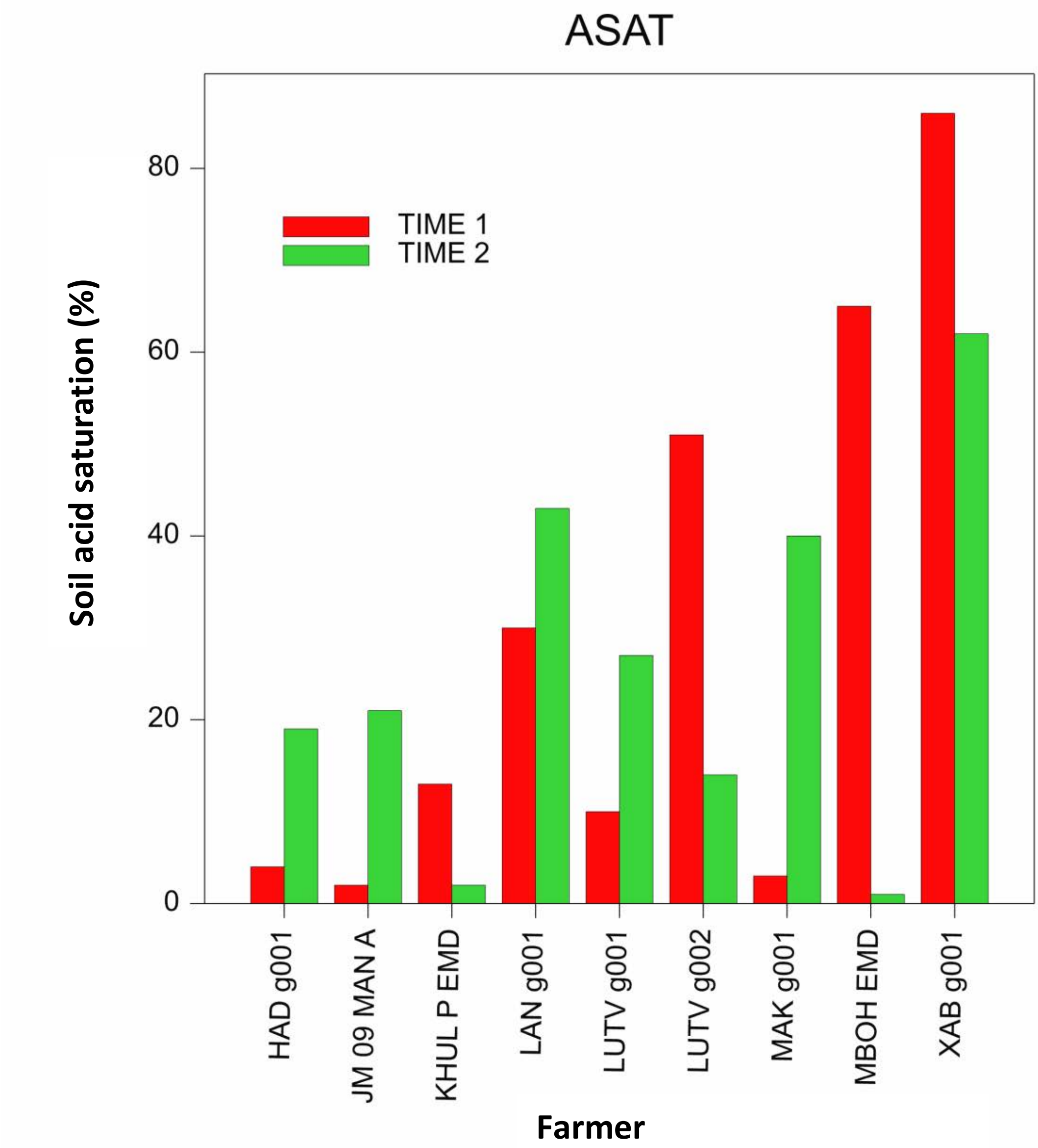


Figure 7. Soil acid saturation values of samples from Estcourt

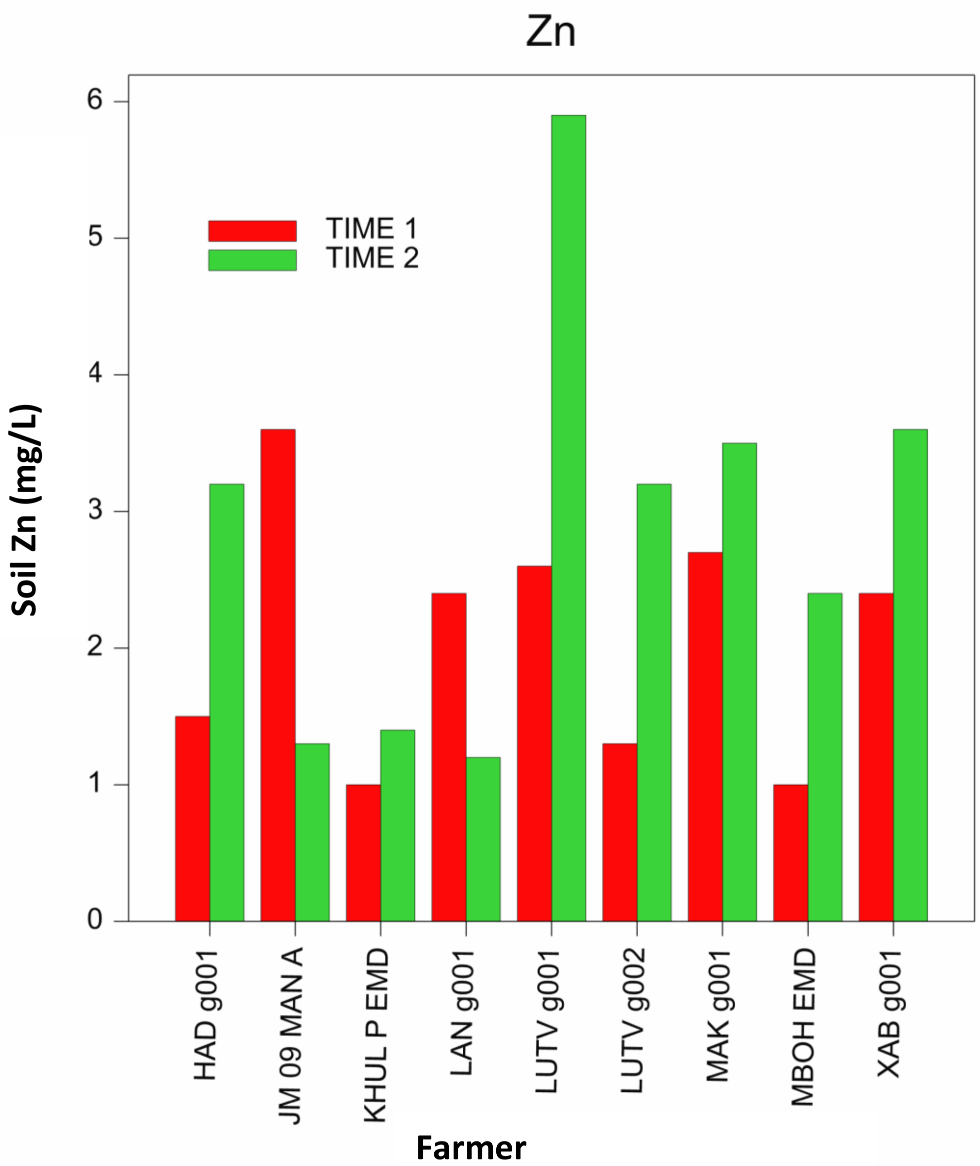
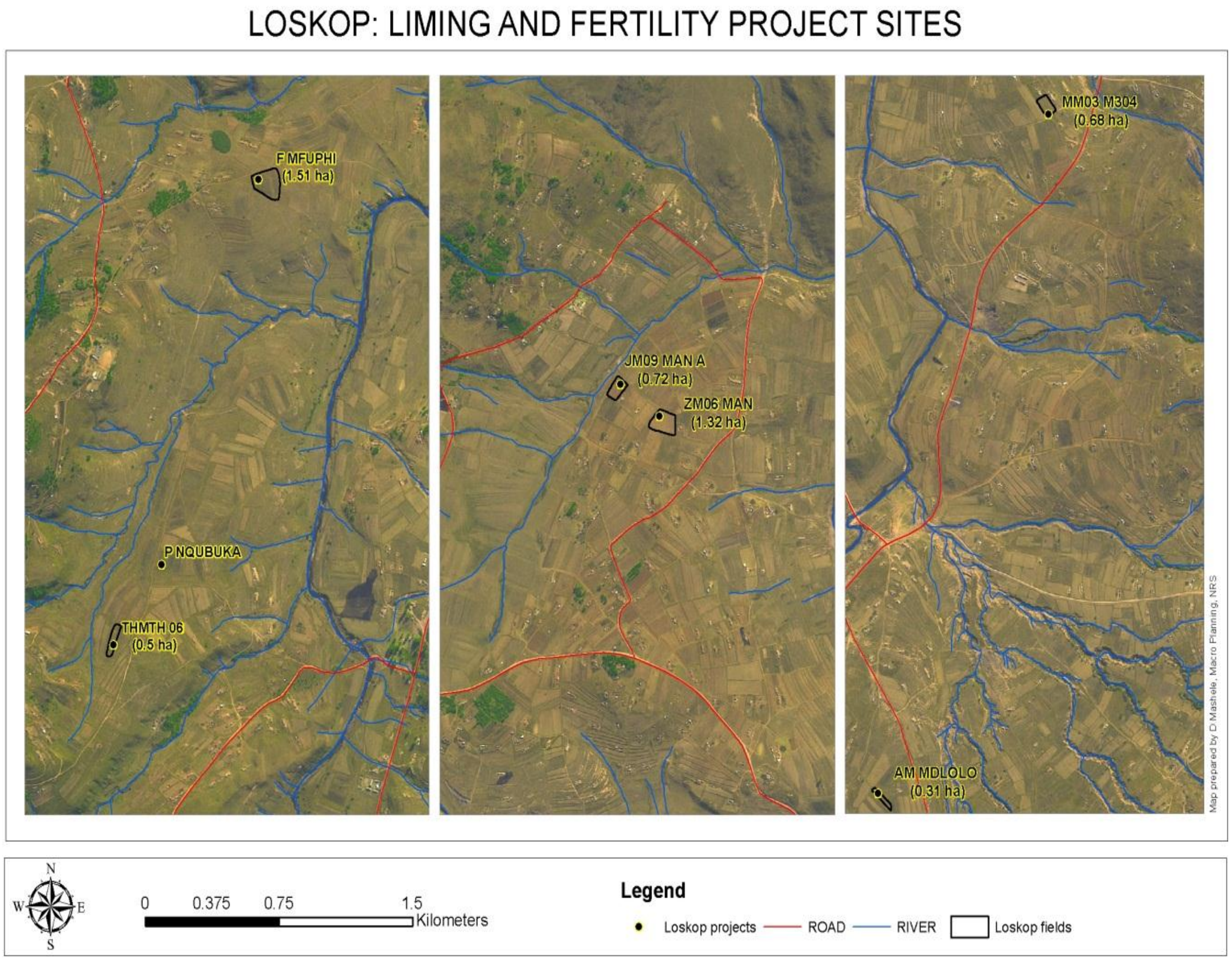


Figure 8. Soil Zn values of samples from Estcourt



Map 4. Sampled Loskop fields

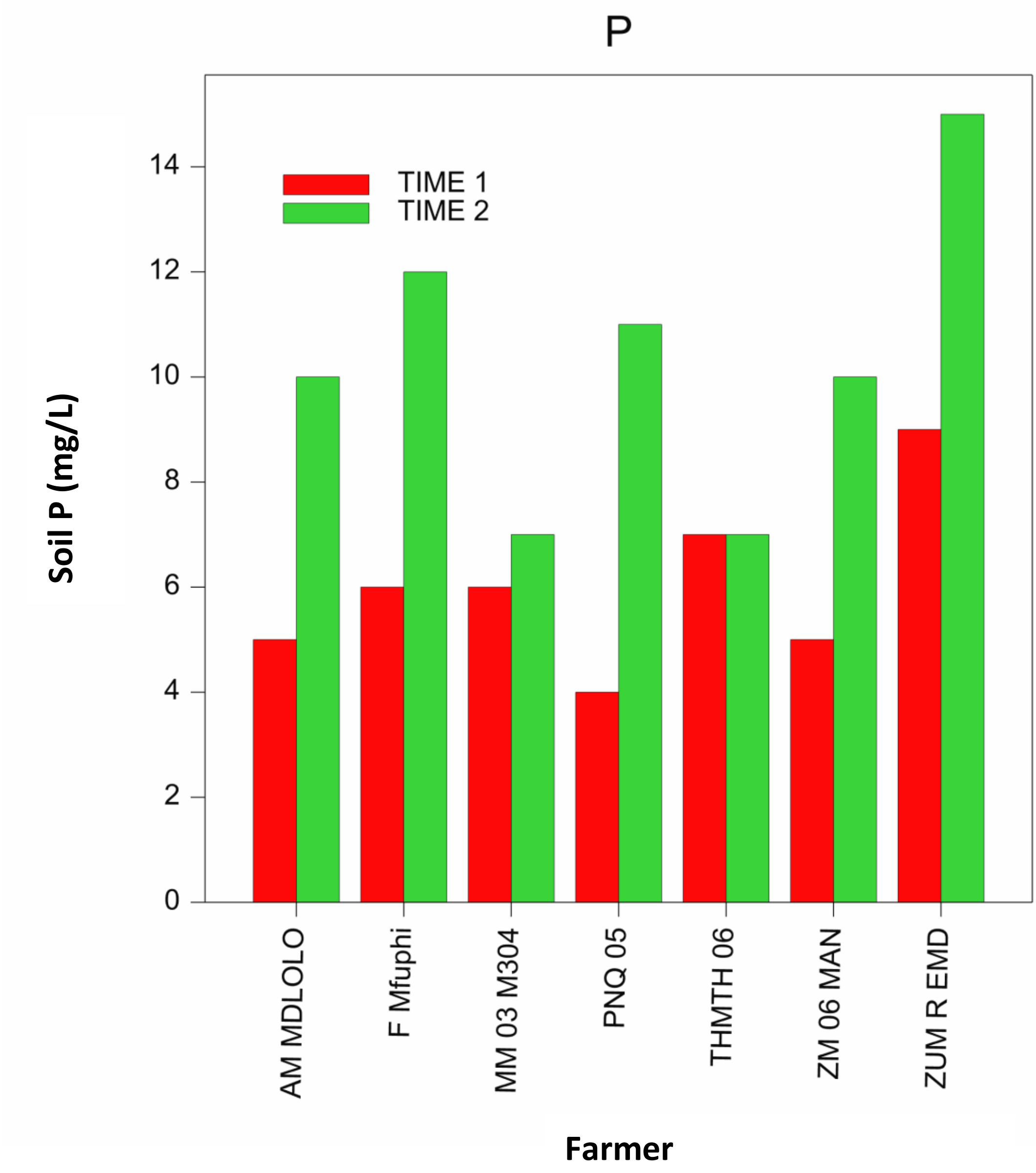


Figure 9. Soil P values of samples from Loskop

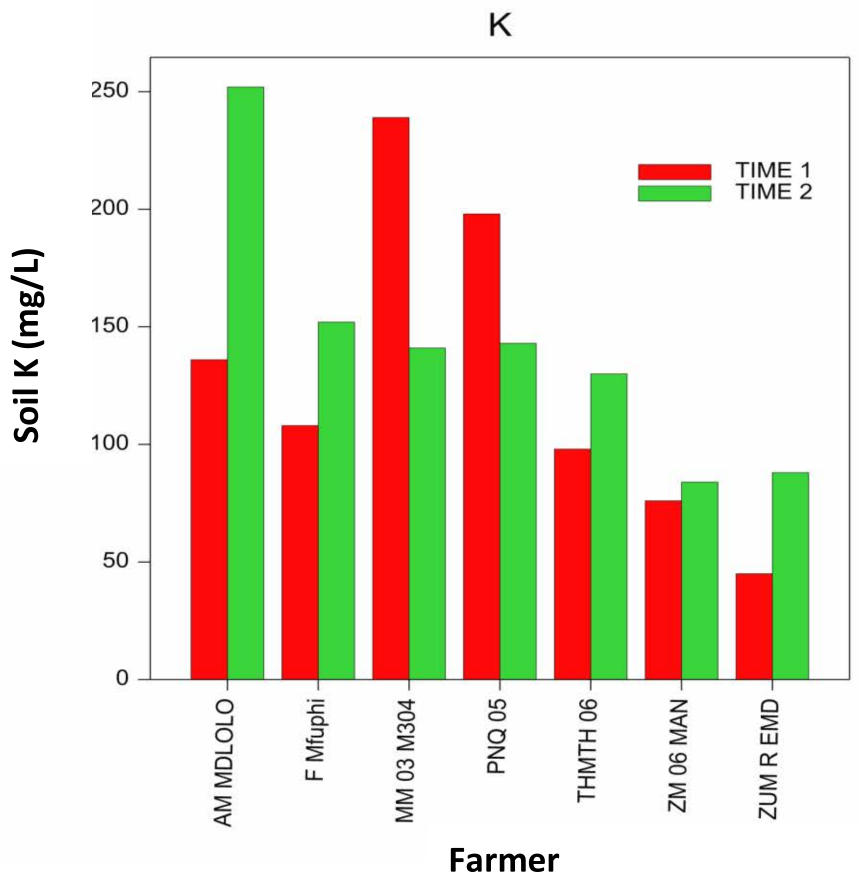


Figure 10. Soil K values of samples from Loskop

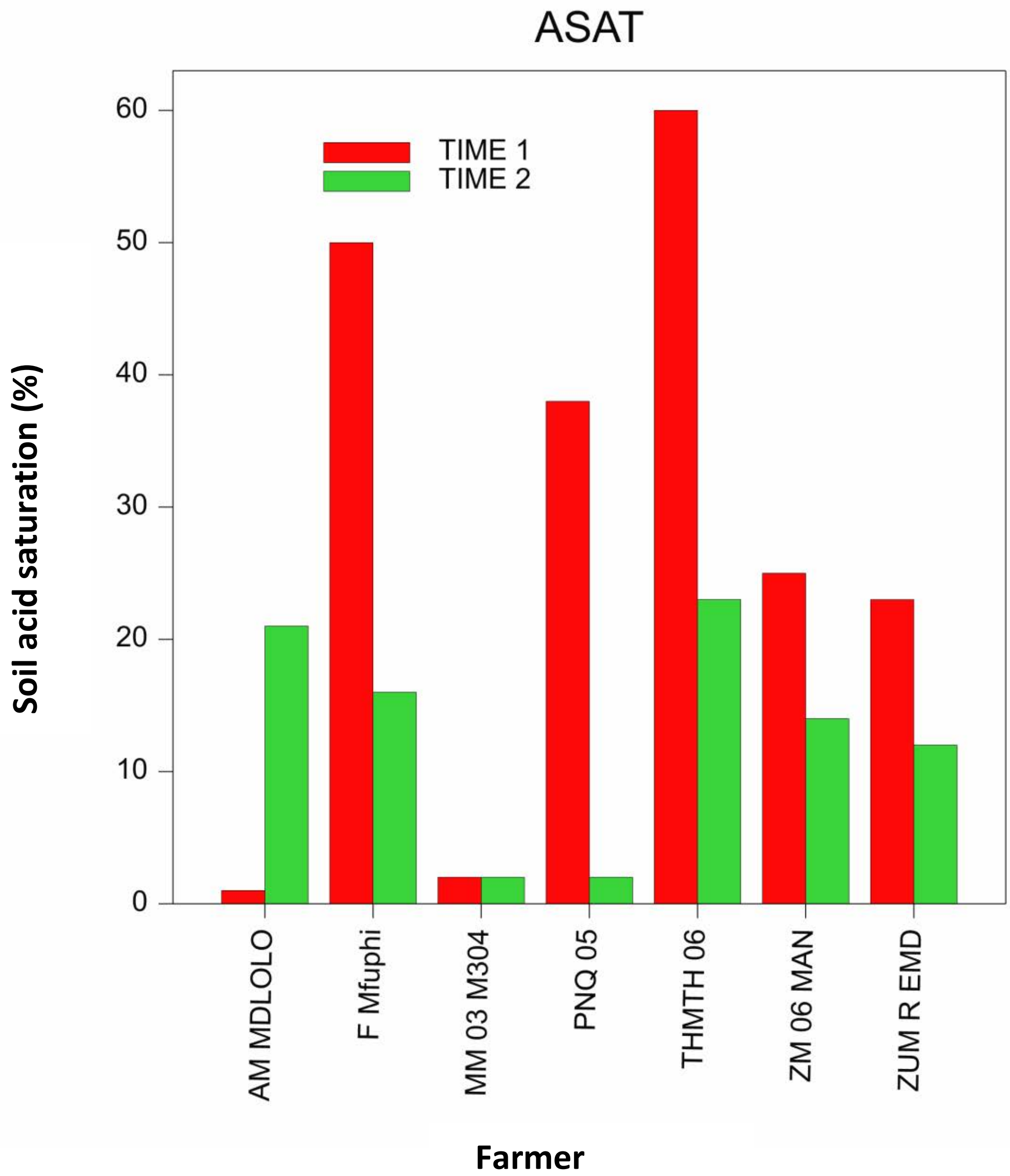


Figure 11. Soil acid saturation values of samples from Loskop

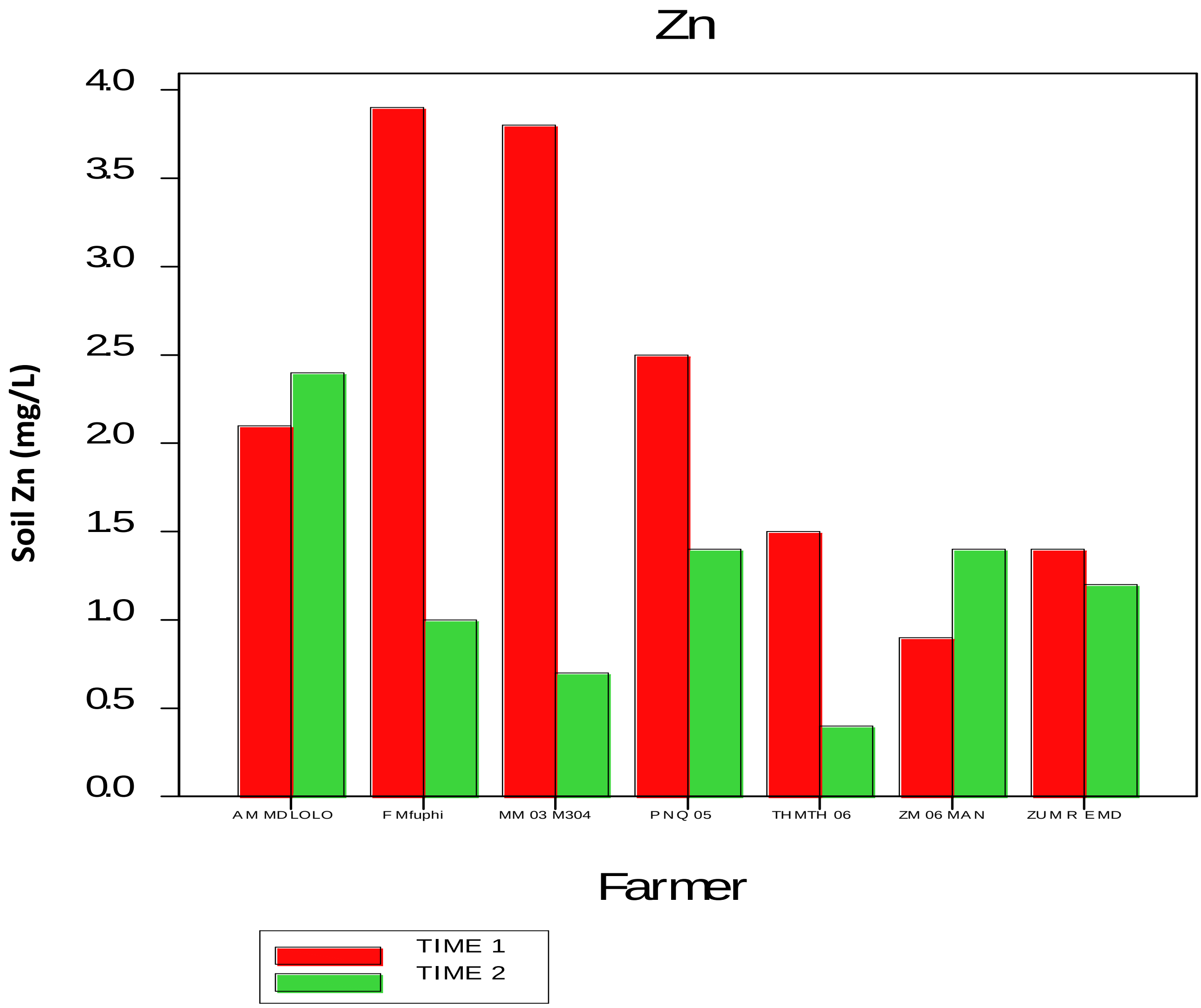
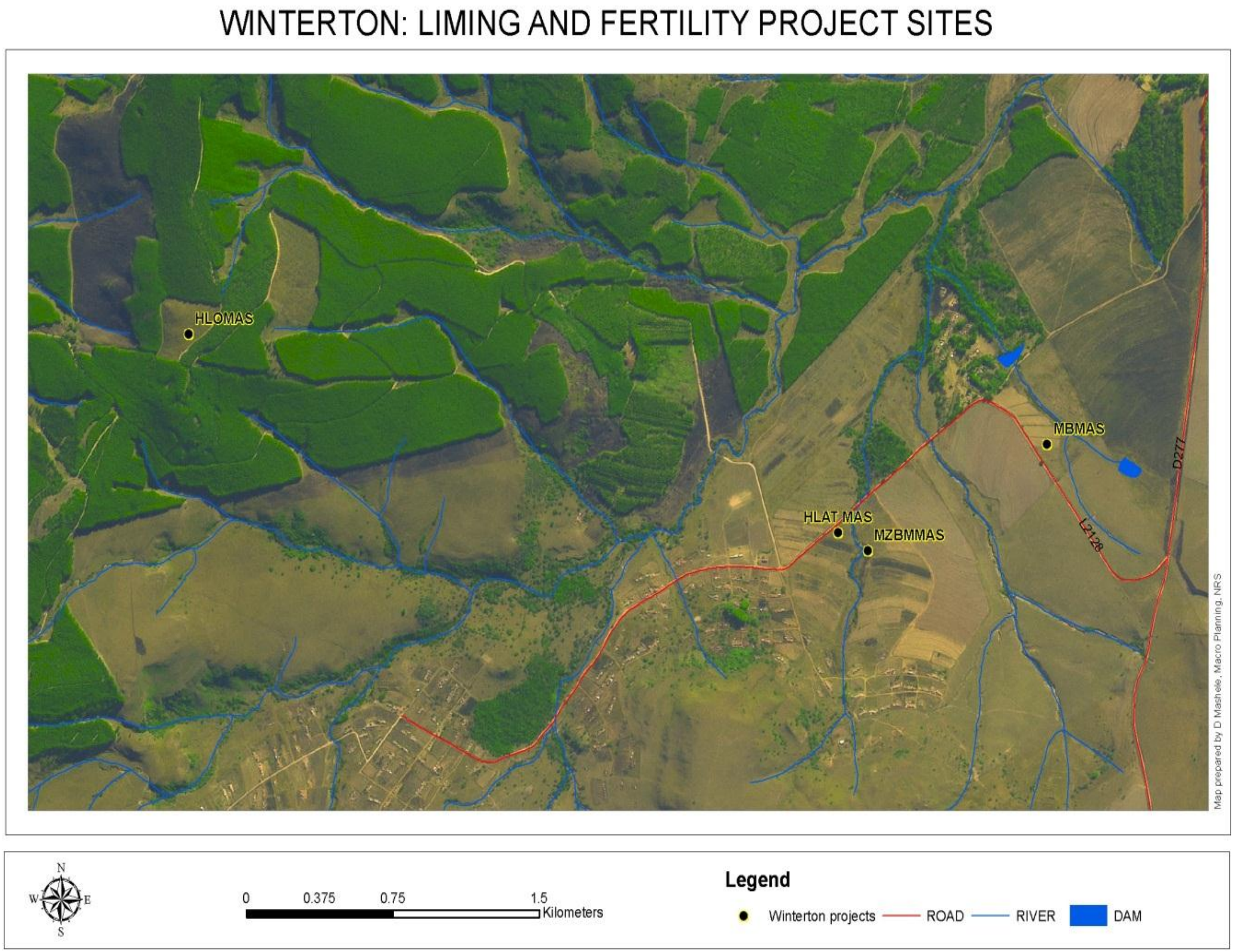


Figure 12. Soil Zn values of samples from Loskop



Map 5. Sampled Winterton fields

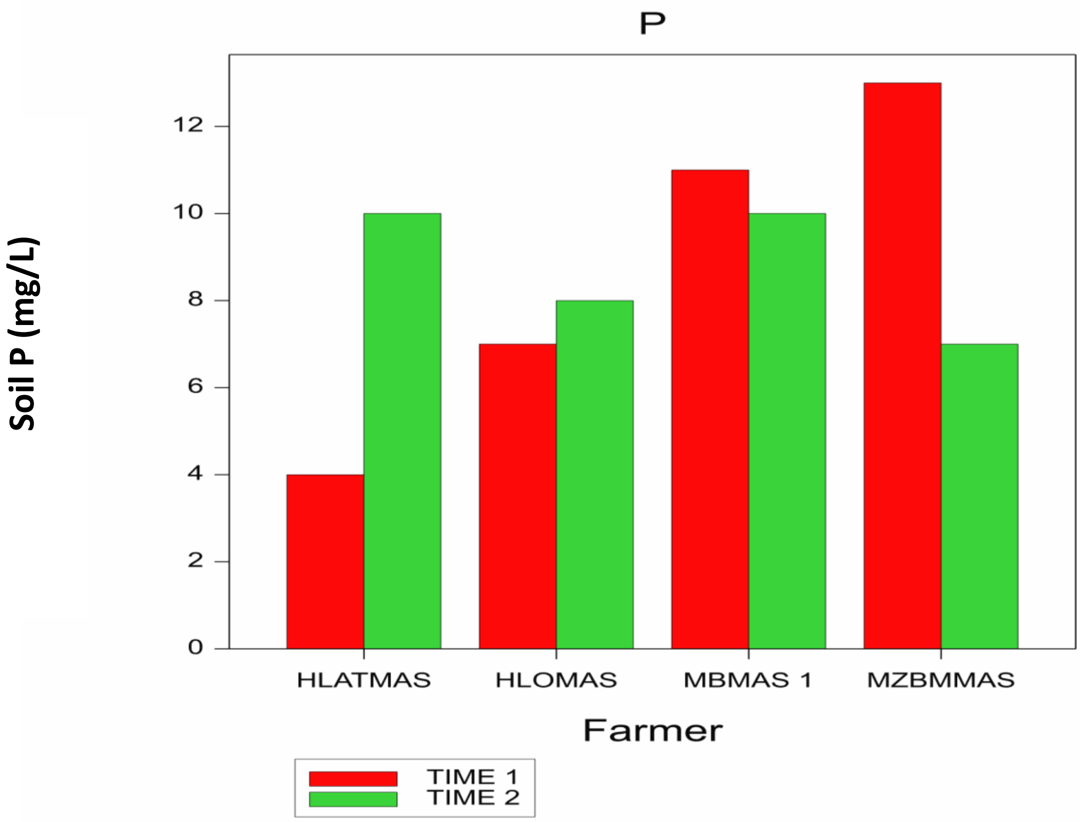


Figure 13. Soil P values of samples from Winterton

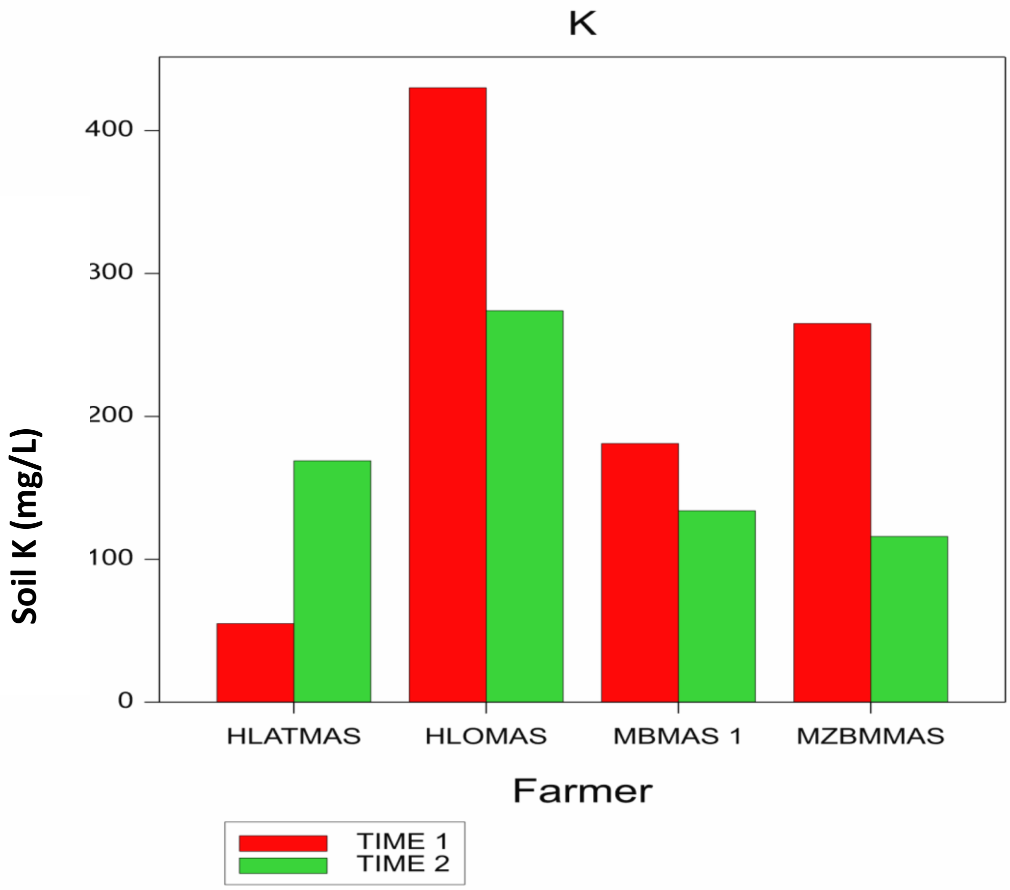


Figure 14. Soil K values of samples from Winterton

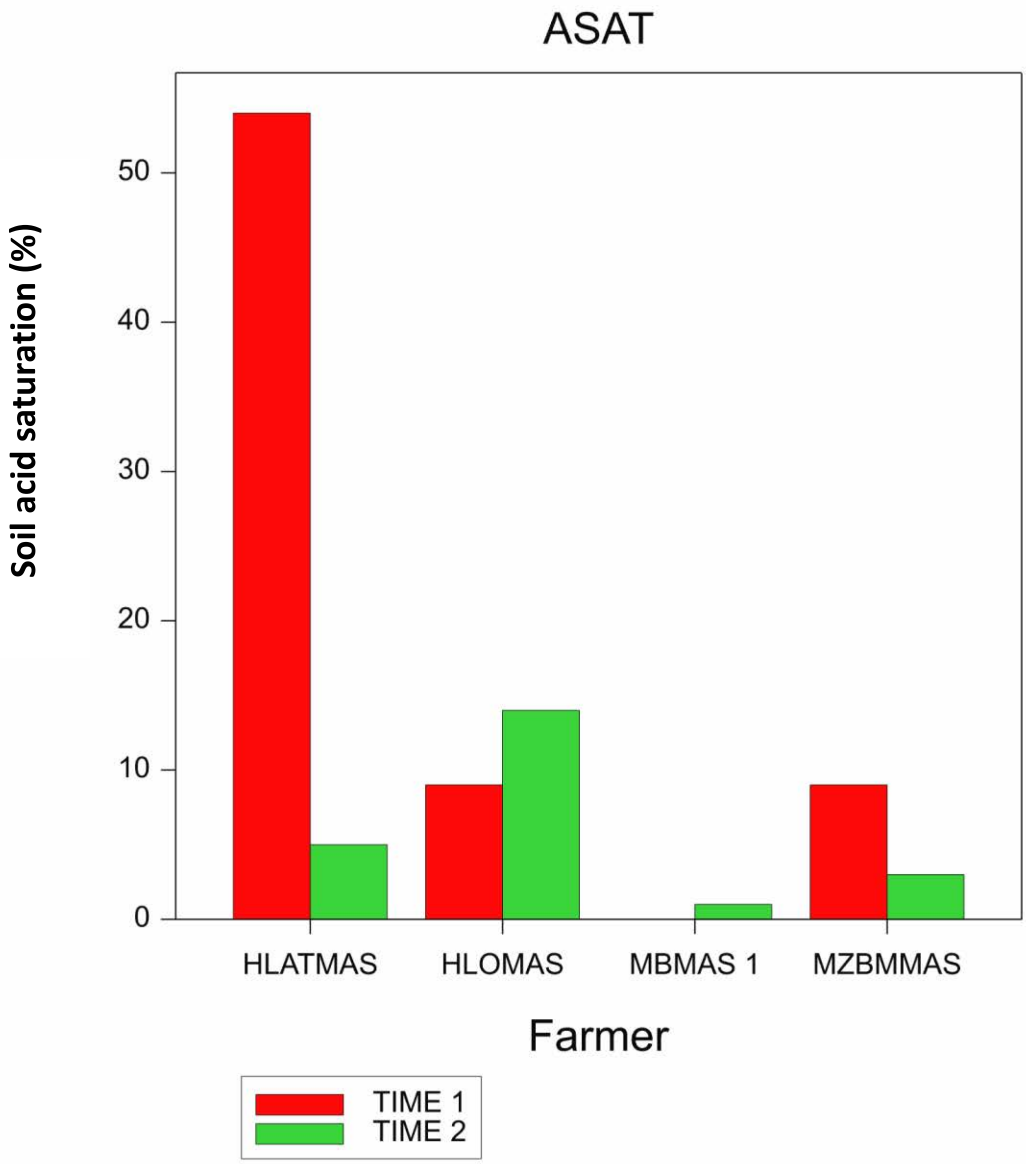


Figure 15. Soil acid saturation values of samples from Winterton

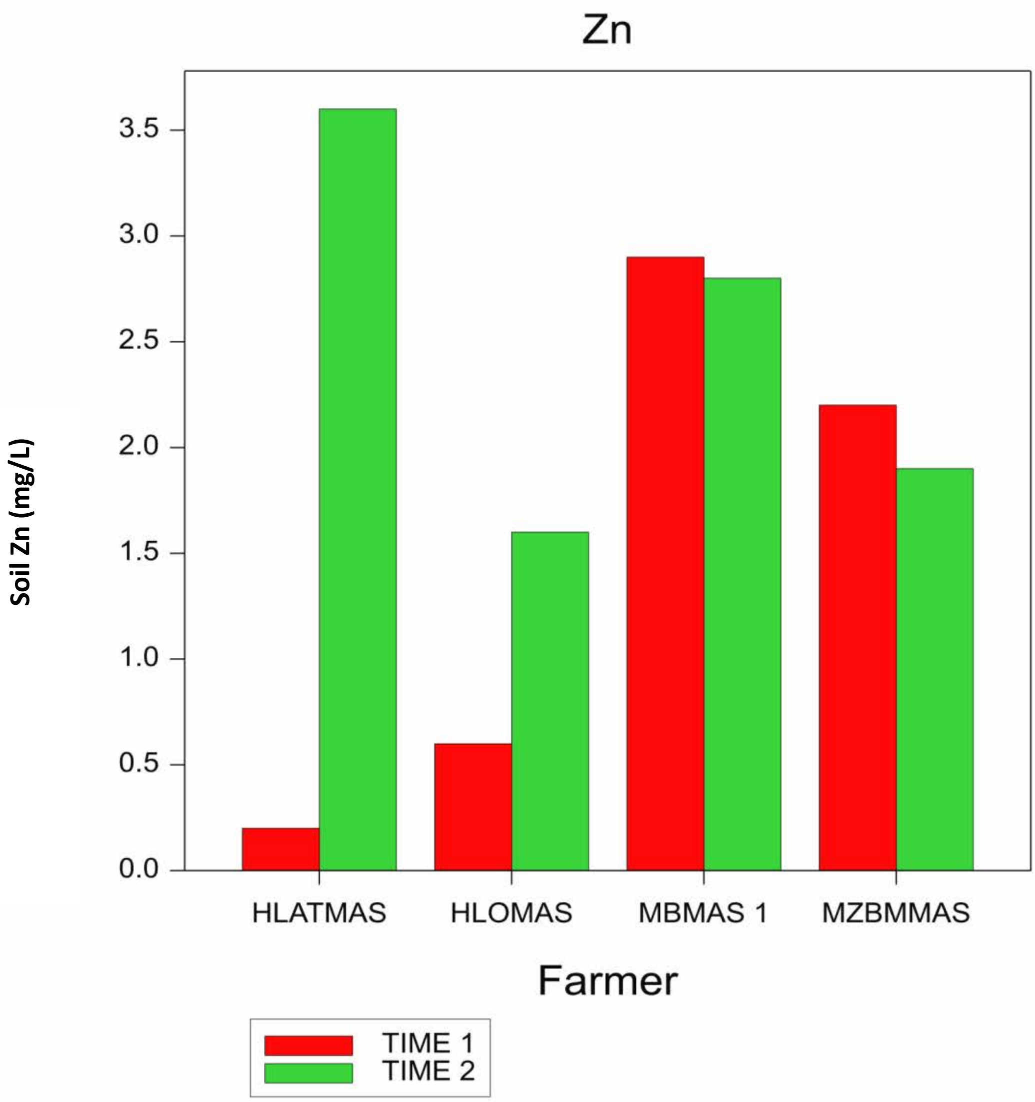


Figure 16. Soil Zn values of samples from Winterton

Conclusion and Recommendations

The soil fertility status of communal lands can be improved significantly with interventions from the Department of Agriculture and Rural Development. It is best to intervene at reasonable intervals before soils become depleted again and to encourage farmers to practice band placement at planting to maintain and improve soil fertility status of cropping lands. Even where P applied is not at required P levels, for maize and dry beans it is still an improvement because it means that farmers will have to band place less P in kg per ha than before which is a financial relief for them.

Where Zn is below 1.5 mg/L those fields should receive band-placed Zn at planting. If the above measures are implemented correctly, together this will ensure yield improvements, which could cascade to a better socio economic situation.