**BBRO PROJECT REPORT FORM**

**Please note the details on page 2 will be used to formulate the BBRO printed Annual Report.**

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| **Project Title:** **Sugar beet response to applications of sulphur fertiliser** |
| **BBRO project no:**  |  |
| **Project sponsor:**  | **16/03** |
| **Interim report / Final report** (delete as appropriate) |
| **Project lead or student name:** | **Dr Simon Bowen** |
| **Project mentor or supervisors:** |  |
| **Report Date:** | **2019** |
| **Reporting period covered:****(e.g. 1/1/16 - 31/12/16)** | **2018 crop year** |
| **Timeline (e.g. Year 1 of 4)** | **Year 1of3** |
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| BBRO use only | Date assessed:  |
|  Assessors comments |  |
|  Action required |  |

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| **Project summary for BBRO Publication (no more than 300 words)** |
| Work on other arable crops such as OSR and cereals has shown that crops frequently respond to additional sulphur fertilisers, especially on lighter land where the risk of sulphur deficiency is greatest. The depletion of atmospheric deposition of sulphur is well documented. The uptake of sulphur by sugar beet is around 50-70kg/ha in average yielding beet crops and as much as 100kg/ha in higher yielding crops. Previous trials have identified small but often inconsistent response of sugar beet to additional soil-applied sulphur. The current series of trials is assessing sugar beet responses on low sulphur sites to additions of 25,50 75 & 100 kg sulphur per hectare. Results in 2017 showed a limited number of statistically significant yield response to any addition of sulphur. There were no symptoms of sulphur deficiency identified in the canopy of untreated plots. The weather in 2017 resulted in very rapid and vigorous canopy growth, especially early in the season. It is likely that plants were able to access soil sulphur reserves efficiently. A survey of the sulphur levels in 30 fields (Beet Yield Challenge fields) in 2017 showed soil levels of sulphate levels (phosphate buffer extractable) to range between 8 and 62 mg/l. Higher soil sulphate levels tended to be associated with higher soil organic matter soils but there was no relationship established between soil sulphate levels, canopy development, leaf sulphur analysis in July and yield. **2018 Results**

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|  | Sugar Yield t/ha |
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|  | Benniworth | Bracebridge | Tansor |
| 0 Kg/ha S | 12.999 | 11.79 | 12.79 |
| 25 Kg/ha S | 12.332 | 12.68 | 12.74 |
| 50 Kg/ha S | 12.781 | 12.23 | 12.92 |
| 75 Kg/ha S | 12.605 | 12.53 | 12.79 |
| 100 Kg/haS | 12.459 | 11.9 | 12.24 |
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|  | Clean Yield t/ha |
|  | Benniworth | Bracebridge | Tansor |
| 0 Kg/ha S | 69.56 | 63.3 | 67.8 |
| 25 Kg/ha S | 65.42 | 66.9 | 66.9 |
| 50 Kg/ha S | 68.19 | 65.6 | 68.3 |
| 75 Kg/ha S | 66.8 | 66.6 | 68.3 |
| 100 Kg/haS | 66.89 | 62.8 | 64.2 |

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|  | Sugar % |
|  | Benniworth | Bracebridge | Tansor |
| 0 Kg/ha S | 18.69 | 18.652 | 18.863 |
| 25 Kg/ha S | 18.853 | 18.94 | 19.032 |
| 50 Kg/ha S | 18.746 | 18.657 | 18.922 |
| 75 Kg/ha S | 18.868 | 18.845 | 18.727 |
| 100 Kg/haS | 18.623 | 18.945 | 19.052 |
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|  | P-values |
|  | Benniworth | Bracebridge | Tansor |
| Sugar t/ha | 0.259 | 0.645 | 0.913 |
| T/ha | 0.146 | 0.733 | 0.78 |
| Sugar % | 0.664 | 0.347 | 0.432 |
| AN | 0.6 | 0.226 | 0.089 |
| Na | 0.345 | 0.036 | 0.118 |
| K | 0.231 | 0.42 | 0.036 |

There were no consistent statistical effects of any sulphur application rate on sugar yield, clean yield and sugar percentage in the 2018 trials at either of the sites. There were some differences between sodium and potassium levels, but these are considered to be unrelated to sulphur levels. All the sites were affected by the severe summer drought conditions in July and August. Plants experienced prolonged period of wilting and demonstrated symptoms of leaf yellowing, necrosis and lower leaf senescence resulting in loss of canopy cover of between 20 & 40%. Following rain in September, leaf regrowth resulted in an increase in crop cover and continued root growth and increase in sugar levels. Analysis of leaf sulphur levels in July showed considerable variation and as leaf growth was significantly affected by drought was not analysed in relation to sulphur applications rates and yield. The survey of soil sulphur levels and commercial crop performance (2018 BYC crops) was undertaken but again severe drought affected most fields, making identification of sulphur deficiencies impossible. |
| **Short summary of key objectives** |
| * Assess the response of beet crops to a range of sulphur application rates across a range of sites with contrasting soil types and cropping regimes.
* Analyse sulphur levels in plants to identify how any responses may relate to deficiency levels (previous work indicates this as >250ppm) and in relation to nitrogen: sulphur ratios within plants.
* A limited survey of sulphur levels in crops will be used to assist in identifying where responses may be most likely to occur.
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| Insert picture/graph | Insert picture/graph |
| **Outcomes/Key messages for growers and industry** |
| * Four sites were unidentified where there was potential for sulphur deficiencies. This included light sandy loam, thin Lincolnshire brash and sandy clay loam soil types. None of the sites had organic manures applied to them.
* There were no effects of sulphur treatments on yield and sugar content measured in 2018 on either site.
* Drought affected all the sites, resulting in range of canopy yellowing, necrosis and leaf senescence. It was not therefore possible to assess visual symptoms of sulphur deficiency and measure plant tissue sulphur levels.
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| **Section 1: To be completed by Project Lead:** |
| **Other project objectives (not listed on previous page)** |
| **Milestones for current period** |
| **Note: mentors will be asked to comment on the status of this project (yellow column) using the scoring system in section 2.** |
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| **Summary of results (including figures and tables)*****For Project Annual Report****: please provide a 2 page summary of key findings from the reporting year.****For Project Final Report:*** *please provide a summary of project findings and outcomes with relevant supporting data.* |
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| **Annual report: Key issues to be addressed next year:** |
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| **Publication of results to date/planned publications**: |
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| **Section 2: To be completed by project mentor** |
| **Status - Mentor’s scoring system for interim reports.** |
| Red | “Major concern - escalate to the next level" Slippage greater than 10% of remaining time or budget, or quality severely compromised. Corrective Action not in place, or not effective. Unlikely to deliver on time to budget or quality requirements. |
| Amber | "Minor concern – being actively managed” Slippage less than 10% of remaining time or budget, or quality impact is minor. Remedial plan in place |
| Green | "Normal level of attention" No material slippage. No additional attention needed |
| **Milestone** | **Comments + action required** | **Status** **R/A/G** |
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| **Is the project on track to meet the stated objectives? (please comment in relation to milestones and the status score awarded in section 1).** |
| **Are conclusions scientifically robust? (please comment on data analysis/interpretation)** |
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| **For final reports only:**  |
| **How would you rate the project against the following criteria (please give a score out of 10, with 10 being highest)**1 ) The project met its original objectives:2) Contribution to scientific knowledge:3) Direct relevance to growers: |