Benchmarking the performance of irrigated sugarcane at Illovo Sugar - questionnaire for data collection.

On 12th December 2019, a new 3 year PhD research contract between Illovo Sugar (Africa) and Cranfield University was established. The aim of the research is to evaluate irrigation management practices at selected Illovo sites in Africa and identify measures to improve water and energy efficiency for sugarcane production.

The project will involve Mavuto Banda (PhD student) with supervision by Professor Jerry Knox and Professor Tim Hess from Cranfield University. The technical leads in Illovo include the Group Agriculture Engineering Specialist (Mr. Darran Boote), Agriculture Manager – Nchalo (Mr Keith Domleo) and Agriculture Engineer – Nchalo (Mr Jaco Burger).

One of the initial objectives of the research is to carry out a benchmarking exercise to establish current levels of performance and identify best practices among the estates across the Illovo (Africa) group. This preliminary questionnaire, aims to identify the types of data required and available. This will help in supporting future interviews/discussions with key informants at each estate and in developing more detailed questionnaire.

The findings from this benchmarking exercise will inform the research direction of the subsequent steps. The findings will also be shared with Illovo staff involved in irrigation management. It is emphasised that the data collected in this exercise and subsequent analyses will be solely used for the purposes of the PhD research. The contract between Cranfield and Illovo and the PhD student includes detailed provision for data protection and confidentiality. Thank you for your support in this research.

Directions for completing the questionnaire

1. The questionnaire has been developed with interactive capabilities, so it can be electronically completed saved and then sent without having to make a print out.
2. For most questions, please choose the appropriate answer(s) from given options. It is advisable that you properly check whether a given question requires you to select only one option or multiple options, type in your own words/figures or select an option from the dropdown menu.
3. Questions that require you to input your own words or figures have been customized to accept an appropriate input type e.g. numbers only, words only or a combination of both text and numbers. Please check you enter numbers/text in the appropriate format.
4. Please do not hesitate to contact Mavuto Banda via the email address provided below if you need clarifications on any of the questions.
5. After completing the questionnaire, save the file with a new filename and then email to m.banda@cranfield.ac.uk

Section A: Respondent Identification

A1. Name: Marc Mulder **A2.** Position: Irrigation Engineering Mar

Section B: Operation Identification Details

B1. Country: Zambia **B2. Estate:** Nakambara

B3. Total estate cane area (ha) (exclude outgrower area): 14,459.00

B4. Does the estate have data/maps (GIS files) showing estate boundaries, field boundaries, water abstraction points, storage reservoirs, canal/pipeline networks either in form of hardcopy (paper) maps or electronic/digital maps? (*Select **ONE** applicable option below*)

☑ **Yes** ☐ **No**

Section C: Irrigation Systems, Water Abstraction, Conveyance and Application

C1. Which of the following irrigation systems are used at the estate? Please tick all that apply (*select **ALL** applicable options*)

- ☐ Basin
- ☐ Border strip
- ☑ Furrow
- ☐ Sprinkler (hand moves, dragline and/or solid set)
- ☑ Centre pivot
- ☐ Linear move
- ☐ Surface and/or subsurface drip
- ☐ Other (specify) _____

C2. What is the area (ha) under each irrigation system selected above? *(Enter the corresponding area for each system on the right hand side)*

Irrigation System	Area (ha)
Basin	
Border strip	
Furrow	10,930.00
Sprinkler (hand moves, dragline or solid-set)	
Centre pivot	3,529.00
Lateral move	
Surface/sub-surface	
Other	
TOTAL Area	**14,459.00**

C3. Does the estate keep records of irrigation abstraction (volume and time) and monitor water use at selected points along the conveyance system? (*Select **ONE** applicable option below*)

☑ **Yes** ☐ **No**

C4. If yes to in (C3, in what format are these records? *(Tick **ALL** applicable options)*

- ☑ Spreadsheet
- ☐ Canepro
- ☐ Books (hardcovers or similar)
- ☐ Loose paper record
- ☐ Other (Specify)_____

C5. How long has the practice of keeping such records been in place? (*enter **number** of years in the box below*)

12.00

C6. Does the estate keep records of irrigation events (timing and amount of water applied during each irrigation event)? (*Select **ONE** applicable option below*)

☑ **Yes** ☐ **No**

C7. If yes to C6, in what format of recording are these records? *(Tick **ALL** applicable options)*

- ☐ Spreadsheet
- ☑ Canepro
- ☐ Books (hardcovers or similar)
- ☐ Loose paper record
- ☐ Other (Specify)_____

C8. How long has the practice of keeping such records been in place? (*indicate the **number** of years in the box below*)

10.00

C9. Does the estate conduct and keep records of field tests to evaluate irrigation uniformity (e.g. catch can tests, advance and recession etc.)?

☐ **Yes** ☑ **No**

C10. If yes to C9 above, in what format of recording are these records? *(Tick **ALL** applicable options)*

- ☐ Spreadsheet
- ☐ Canepro
- ☐ Books (hardcovers or similar)
- ☐ Loose paper record
- ☐ Other (Specify)_____

C11. If yes to C9 above, how frequent are these tests conducted?
(*indicate **number** of times in a growing season in the box below*)

☐

C12. How long has the practice of keeping such records been in place?
(*indicate **number** of years in the box below*)

☐

C13. Does the estate keep records of irrigation system failure due to breakdowns, power failure and/or any other causes (Lost Time Available - LTA)?

☑ **Yes** ☐ **No**

C14. If yes in (C12) above, in what format of recording are these records?
*(Tick **ALL** applicable options)*

- ☑ Spreadsheet
- ☑ Canepro
- ☐ Books (hardcovers or similar)
- ☐ Loose paper record
- ☐ Other (specify)_____

C15. If yes in (C12) above, since when has the practice (of keeping such records) been in place? (*indicate **number** of years in the box below*)

C16. Which of the following are the sources of energy are used for irrigation pumping on the estate? *(Tick **ALL** applicable options)*

- [x] Hydro-electricity
- [ ] Fuel (petrol/diesel)
- [ ] Solar panels
- [ ] Wind turbines
- [x] Other (specify) Mill power generation - bagasse

C17. Does the estate keep records of irrigation related energy consumption (electricity bills, sunshine intensity/hours and/or fuel cost)?

[x] **Yes** [ ] **No**

C18. How long has the practice of keeping such records been in place? (*indicate **number** of years in the box below*)

10.00

C19. Does the estate keep 'first burn – first irrigation' records?

[x] **Yes** [ ] **No**

C20. How long has the practice of keeping such records been in place? (*indicate **number** of years in the box below*)

10

Section D: Crop Production

D1. Does the estate keep records of cane productivity (yield) at the field level (tons/ha)?

☑ **Yes** ☐ **No**

D2. If yes in (D1) above, which of the following does the estate record? *(Tick **ALL** applicable options)*

- ☑ Growth start date
- ☑ Date of harvesting
- ☑ Tons cane per hectare
- ☐ Tons sugar per hectare
- ☐ Sucrose recovery
- ☐ Moisture content at the factory

D3. If yes in (D1) above, since when has the estate been recording the production parameters? (*indicate **number** of years in the box below*)

10.00

Section E: Climate and Soil data

E1. Does the estate have a weather station?

☑ **Yes** ☐ **No**

E2. If yes to (E1) above, specify the type of weather station below *(Tick **ALL** applicable options)*

- ☐ Automatic weather station
- ☑ Manual weather station
- ☐ Combination of both manual and automatic

E3. If yes to (E1) above, which of the following elements are recorded at the weather station? *(Tick **ALL** applicable options)*

- ☑ Rainfall
- ☑ Temperature (max and min)

- [x] Evapotranspiration (ET)
- [x] Relative humidity
- [x] Wind speed
- [x] Solar radiation
- [x] Sunshine hours
- [ ] Soil temperature
- [ ] Other (specify)_____

E4. How long has the practice of keeping such records been in place? (*indicate **number** of years in the box below*)

10.00

E5. Does the estate have field level records of soil characteristics (texture, organic matter content, soil depth, water holding capacity etc.)?

- [x] **Yes**
- [ ] **No**

C4. If yes in (E5) above, what was the method of data collection for these records? *(Tick **ALL** applicable options)*

- [x] Field sampling and lab analysis
- [ ] Electromagnetic induction (EMI) scanning
- [ ] Other (specify) _____

END of Questions – thanks for your time!