

APPENDIX B. *BILL OF QUANTITIES*

Installation of Solar-Powered Irrigation Facilities for Tebgi Pilot sites

LOCATION: TEGBI AND DZITA COMMUNITIES

PREPARED BY: LASJOE Consult

NOTES; In case, if the product brand differs from that of the vender, the Vender shall specify product brand in the quotation. Please

INTEGRATED SPRINKLER & DRIP IRRIGATION MATERAILS: Complete drip irrigation system of 100 by 50 meter land, divided into 8 demo plots of 24 by 24 meters, the laterals/dripers should be spaced 50cm apart along the manifold/submain line, the in-built emitter should be spaced 30cm apart along the drip lateral line. Detailed of the demo plot are specified in the drip irrigation layout

A. Borehole Drilling (8-10m depth) for 2 No.

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
A1	Survey	Hydrogeophysical water survey and reporting	LS	2		-
A2	Preliminaries	Site mobilization and demobilization	LS	1		-
A3	Borehole Drilling	Borehole drilling up to 10m each for 2 boreholes including geophysical site investigation for two (2) boreholes)	m	20		-
A4	Borehole Construction	Supply and install concrete cast	m	20		-
		Supply and Install Gravel Pack at appropriate depth with seal / grouting for each Borehole	No.	2		-

A5	Pumping Test and reporting	Perform three-step-drawdown and select appropriate pumping rate for a 24-hour constant-rate pumping test with 8-hour recovery and submit all pumping test report for the two boreholes. Sustainable yield shall be assessed against CWR and irrigation demand, not solely on duration criteria.	LS	2		-
A6	Water Analysis	Laboratory analysis of water quality and submission of the water quality report	No.	2		-
Subtotal A						-

B. Solar Mechanization of 2 No. Boreholes with All Accessories

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
B1	Surface Water Pump	DC or hybrid surface Solar Pump (30 -60 m ³ /day @ 10 m head) with built-in dry-run, overvoltage, overload, and thermal protection mechanisms	No.	2		-
B2	Pump Controller	Solar Pump Controller (2.2 – 3.0 kW rating) features Controlling and monitoring, Control inputs for dry running protection, remote control, Protected against reverse polarity, overload and overtemperature Integrated MPPT (Maximum Power Point Tracking) Integrated Sun Sensor etc	No.	2		-
B3	Sensors	Well probe sensor V2 for dry run protection	No.	2		-
B4	Splice Kit	Cable splice kit 2.5-6sqmm	No.	2		-
B5	DC PV Isolator Switch	DC PV Isolator Switch (Solar Array Disconnect), minimum 400 V DC, rated ≥50 A, suitable for photovoltaic systems, IP65 or higher, complete with enclosure and lockable handle	No.	2		-

B6	Borehole Cable	4 mm ² submersible copper cable (depending on borehole depth and pump current)	m	20		-
B7	Sensor Cable	Sensor Cable, 1mm ² x 2 core Sub. Cable	m	20		-
B8	Supply line pressure sensors	Liquid Pressure Sensor, LPS-1000	No.	2		-
B9	Rope	Safety Rope 10kg	m	20		-
B10	Surface Water Pump Discharge	50mm (PN16) HDPE riser main pipe	m	20		-
B11	Well head	Well Head with hydraulics assemble set including Gate Valve, Non-Return Valve etc.	No.	2		-
B12	Installation accessories etc.	Cable Termination kits, cable ties ,50mm x 1 1/2" Adaptor etc.	LS	2		-
B13	PV Generator	550W Mono PV Panels (>21% efficiency)	Wp	3,300		-
B14	Solar Panel wiring	4mm ² Solar power cable (Black & Red) for 2 boreholes	m	20		-
B15	Mounting Structure	Concrete/Galvanized steel/aluminum, ground-fixed, tilt approx. 15°, designed for wind speeds >120 km/h	Set	2		-
B16	DC MCB / Breaker (Pump/Controller protection)	16 Amp, 2P DC MCB (or approved equivalent)	No.	2		-
B17	Earth Rod	Copper-clad earth rod (min 2.4m) completes w	No.	2		-
B18	Earthing Cable	16mm ² copper earth cable (green/yellow), incl. lugs & clamps- for 2 boreholes	m	20		-
B19	Earthing pit / inspection chamber	Earth pit complete with cover, moisture retention material as required	No.	2		-
B20	Surge Protection Device (SPD)	DC SPD for PV input / controller protection (Type II or equivalent)	Set	2		-
B21	PV Combiner / Junction Box (if required)	IP65+ enclosure with terminals, fuses/isolator as required	No.	2		-
B22	PV Mounting Accessories	Module clamps, rails, bolts, nuts, anchors and anti-theft fasteners	Lot	2		-
B23	Controller Enclosure Cabinet	Weatherproof lockable cabinet for controller (IP54+) with mounting backplate	No.	2		-
B24	Operation & Maintenance Manuals	Operator handbook in English/local language (hard + soft copy)	Set	2		-

B25	Operator Training	On-site training for WUA/operators incl. attendance sheet	LS	2		-
B26	Spare Parts Kit (2-year)	Manufacturer recommended spares: seals, fuses, connectors, sensors, etc.	Set	2		-
B27	Installation Cost	Labour, installation, testing and commissioning charges	LS	2		-
Subtotal B						-

C. Water Storage & Piping for 3 No. Storage tanks

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
C1	Water Storage Tank	5000 L Rambo Polytank (HDPE)	No.	4		-
C2	Piping	HDPE pipes, 50 mm diameter, including fittings	m	40		-
C3	Flow meters	50mm flow meters including fittings	No.	2		-
C4	Level Control	Float switch for automated water level control	No.	3		-
C5	Cable	Electric cable for float switches for 2 Boreholes	m	40		-
C6	Accessories	Outlet taps and other additional Accessories	LS	3		-
C7	Installation Cost	Labour, installation, testing and commissioning charges	LS	3		-
Subtotal C						-

D. Civil Works and Fencing for No. 2 Borehole System

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
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D1	Pump Control and Solar Panel chamber	Set out pump control chamber and chain-link fencing (4m x 4m)	Item	2		-
D2	Site Preparation	Site preparation, clear site of vegetation and shrub undergrowth and cut down small trees not exceeding 500mm girth(2 Locations)	m ²	72		-
D3	Excavation works	Excavation of foundation trenches average width 450mm, maximum depth 600mm, backfill and remove from site	m ³	36		-
D4	Concrete works	Provide and place concrete grade 20 in gate pillars, 150x150x2000mm high above ground level reinforced with 4no, 16mm diameter high tensile steel bar, 8mm diameter bar as stirrups at 200mm centers, with a pad foundation of 450x450x600mm deep and concrete 200mm thick, including earthworks, and formwork.	No.	2		-
D5	Galvanized Pipe pillars	G.I. Pipe Post 50mm dia in dog-leg form, including base concrete and painting with 3 coats of aluminum oxide oil paint	No.	10		-
D6	Barbed wire	Aluminum barbed wire, 3 rows fixed on dogleg posts	m	23		-
D7	Chain-link Mesh	3mm PVC coated wire Chainlink Mesh 1.8m high	m ²	16		-
D8	Tension Wire	3 rows of alum. coated 3mm tension wire	No.	2		-
D9	Gate	Single leaf metal gate, overall size of opening space; 1800 x 1800mm high; with 50mm galvanized pipe as stiles, top, bottom and bracing rails; cover one side with 3mm diameter expanded galvanized iron square mesh as shown in drawing. Include painting with one coat red oxide under coat and two finishing coats of gloss oil paint; supply one brass padlock; and base concrete to tower bolt	No.	2		-

D10	Site grading	Grading of site, to provide a level surface, and supply, spread and compact graded surface with laterite material 300mm thick and cover surface with 150mm thick layer of 12-20mm size hard stone chippings.	m ³	10		-
D11	Block work	150mm thick sandcrete blockwork laid in trenches 450mm high above ground level, including concrete, grade 15, 0.23mm thick as concrete in foundation, and rendering both sides of blockwork above ground level.	m ²	16		-
D12	Pump Chamber & Cover Plate	150mm thick solid blockwork internal dimensions 900 x 3000mm, height of 1.0m all sides rendered, with 4 No. 4mm checkered plate lockable cover and brass padlock. Include painting with one coat red oxide under coat and two finishing coats of gloss oil paint	No	2		-
D13	Signage	Weatherproof and UV-resistant signage (Galvanized Sheet) to be mounted at the gate or main entry point indicating project financier (FAO) and partners such as MOFA etc.	No.	1		-
D14	Padlocks	Provide high security padlock to gate (measured separately)	No.	2		-
D15	Water Tank Stand	Construction of reinforced concrete tanks stand for 3 No. 10,000 liters polyethylene water storage tanks, complete with pad foundations, columns, beams, slab, access ladder and handrails. Overall size: 9.6 m × 3.6 m × 3.0 m high				
D15a		Site clearing and setting out	L.S	1		-
D15b		Excavation for column pad foundations	m ³	6		-
D15c		Hardcore filling and compaction	m ³	4		-
D15d		Blinding concrete (50 mm thick)	m ³	0.6		-

D15e		Reinforced concrete pad foundations (1.2 m × 1.2 m × 0.4 m)	m ³	3.5		-
D15f		Reinforced concrete columns (300 mm × 300 mm × 3 m high)	m ³	2.2		-
D15g		Reinforced concrete beams (300 mm × 450 mm)	m ³	2.5		-
D15h		Reinforced concrete slab/platform (150 mm thick)	m ³	2.7		-
D15i		Reinforcement steel bars (Y12, Y16, Y20 including binding wire)	kg	600		-
D15j		Formwork to columns, beams and slab	m ²	70		-
D15k		Tank support plinths / ring beams	m ³	0.8		-
D15l		Access ladder (galvanized steel)	No	1		-
D15m		Handrails around platform (steel)	m	12		-
D15o		Concrete curing and finishing	L.S	1		-
D16	Additional concrete works	Concrete plinths for PV mounting, controller cabinet foundation, earthing pits, and minor concrete works for cable trench protection	m ³	2		-
Subtotal D						-

E. Operation & Maintenance Tools and Spare Parts

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
E1	Electrical Spares	Minimum list of spare parts, including emitters (2% spare), filter gaskets, MC4 sets, fuses, pressure gauges, and a spare pressure regulator.	Set	1		-
E2	Maintenance Toolkit	Basic toolkit for routine system maintenance	Set	1		-

E3	Training	End-user/caretaker training on system operation, upkeep and troubleshooting with deliverables including an attendance list, user manuals, a brief guide in the local language, and a maintenance logbook.	LS	1		-
Subtotal E						-

F. Irrigation system (hybrid sprinkler and drip) for 2 acres Crop Field

Item No.	Description	Specification	Unit	Qty	Unit cost (GHS)	Total Amount (GHS)
F1	Land Preparation	Land preparation for the 2acres farmland involves clearing, levelling, soil conditioning and making beds/ridges to ensure uniform water distribution for sprinkler and drip hybrid irrigation	Acre	2		-
F2	Main Pipe	HDPE 90mm Main lines for distribution mains	Coil	1		-
F3	Plug Joint	HDPE 90mm Plug Joint	No.	2		-
F4	Clamp Saddle	HDPE 90mmx 2" Clamp Saddle	No.	2		-
F5	Sub main pipes	63mm HDPE irrigation pipe	No.	2		-
F6	Drip Lines	16mm x 400m Drip Tubing with Emitters(2l/h)	No.	27		-
F7	Sand Filter	2-stage corrosion-resistant filtration unit comprising primary sand media filter and 90 mm secondary disc/screen filter (~120 µm) with backwash valves and manifolds.	No	2		-
F8	Valves and Flow Meters	Zone valves, air-release and end-flush valves, and flow meters for each 1-ha block	LS	2		-
F9	Accessories	Drip pipe kit Accessories box, 10,000	No.	2		-
Subtotal F						-

Grand Summary per site (location)

#	Description	Amount (GHS)
A.	Borehole Drilling (10 m depth) for 2No.	-
B.	Solar Mechanization of 2 No. Boreholes with All Accessories	-
C.	Water Storage & Piping for 3 No. Storage tanks	-
D.	Civil Works and Fencing for 2 No. Borehole System	-
E.	Operation & Maintenance Tools and Spare Parts	-
Sub Total (Borehole Drilling, Pumping System and Water Storage)		
F.	Irrigation system - drip line and piping system for 2 acres farmland	-
G.	Total per site (A+B+C+D+E+F)	-