



Terms of reference:

Supply and Installation of Solar-Powered Agro-processing Systems

1. Background

[Energising Development \(EnDev\)](#) is a multi-donor energy access partnership funded by the governments of the Netherlands, Germany, Norway and Switzerland. In Uganda, EnDev is implemented by [Deutsche Gesellschaft für Internationale Zusammenarbeit \(GIZ\) GmbH](#) in close cooperation with the Ministry of Energy and Mineral Development (MEMD) to expand access to modern energy services for households, social institutions and small and medium enterprises. The programme focuses on market development for solar PV, improved cookstoves, and higher-tier cooking solutions, alongside strengthening the enabling environment that allows these markets to grow sustainably.

EnDev Uganda has successfully supported the market development of Productive Use of Energy (PUE) technologies such as solar irrigation, refrigeration, and other enterprise-level solar PV applications, including carpentry, salons, ICT, and restaurants. These applications have demonstrated clear commercial viability.

Building on these successes, EnDev Uganda seeks to promote underdeveloped productive use of energy applications in agro-processing. Milling and hulling services are among the most common agro-processing activities of rural enterprises, but they often rely on diesel engines and unreliable grid electricity.

Solar-powered agro-processing presents an opportunity to improve the profitability of the enterprises, reduce greenhouse gas emissions and increase access to reliable processing services.

EnDev Uganda will establish demonstration sites at selected enterprises across Uganda to demonstrate the commercial and technical viability of these technologies. The sites will serve as practical business cases to encourage wider market adoption by private enterprises and overall unlock market opportunities for solar agro-processing technologies.

EnDev therefore seeks to engage a qualified contractor to supply, deliver, install, test, commission and provide after-sales support for solar-powered milling and hulling systems at selected enterprises in Jinja, Mbale, Bugiri, and Lira.

2. Scope of Work

2.1. Activities of the contractor

- Supply and deliver complete solar-powered milling and hulling systems¹ as detailed in **section 3** below.
- Install, test and commission the systems at selected enterprises
- Ensure systems meet the required technical specifications.
- Build the capacity of operators through practical training sessions.
- Provide warranty and after-sales support.
- Collaborate with EnDev on activities related to knowledge dissemination and market awareness of installed solar-powered agro-processing systems. This may include participation in demonstration events or stakeholder engagement activities organised by GIZ-EnDev or other relevant partners.
- Where feasible, support linkages with potential users, enterprises, and stakeholders around the demonstration sites to encourage wider uptake of solar-powered agro-processing technologies.

¹ Bidders with remote monitoring capability for their proposed milling or hulling systems will have an added advantage.

2.2. Project Sites and Technology Deployment

The contractor shall supply, deliver, install, test, commission, and provide after-sales support for **eight (8) solar-powered agro-processing systems** across four selected enterprises. The systems comprise **four (4) solar-powered hullers, three (3) large solar-powered mills, and one (1) solar-powered micro hammer mill**. The distribution of the systems and the corresponding value chains are presented in **Table 1**.

Photographs of each project site are provided in the Appendix to this ToR for reference only.

These photographs are intended to provide bidders with an indication of the available installation space, existing infrastructure, roof conditions, and general site characteristics. Bidders shall use this information to inform their proposed system design and installation approach. Bidders who wish to conduct a physical site visit to verify site conditions may do so at their own cost and shall coordinate with GIZ in advance to arrange access to the respective sites.

Table 1: Project Sites and Proposed Solar Agro-processing Technologies

Enterprise	Location	Technology	Main value chain processed
Bumalema Traders Ltd	Mbale district, Bumbobi Subcounty, Bumalema Village, 9km from Mbale city, 4 km off Tororo-Mbale road (Google Maps Pin)	Solar-powered huller	Rice and maize
		Solar-powered mill	Maize and millet
Bugiri Crop Kings Ltd	Bugiri district, Busowa South village, 39km from Iganga town, along Jinja-Tororo Road (Google Maps Pin)	Solar-powered huller	Rice
		Solar Micro Hammer mill	Maize, millet, roasted soya
Youth for Life Tree Planting	Lira district, Ogur Subcounty, Omonoanyigedo Village, 21km from Lira city along Lira-Kitgum Road (Google Maps Pin)	Solar-powered huller	Maize
		Solar-powered mill	Maize, millet, roasted soya
Dhero Group Ltd, Jinja	Jinja district, Buwenge town council, 29km from the new Jinja Nile bridge, along Kamuli Road. (Google Maps Pin)	Solar-powered huller	Maize
		Solar-powered mill	Maize

The detailed site-specific technical specifications are provided in the attached Uncosted Bill of Quantities (BoQ).

2.3. Supply of Equipment

The contractor shall supply all equipment required including but not limited to, solar photovoltaic (PV) modules, hybrid inverter(s) where applicable, Maximum Power Point Tracking (MPPT) charge controller(s) where applicable, lithium-ion battery bank(s), milling machine(s), hulling machine(s), motor controller(s), motor starting equipment where applicable, mounting structures, AC and DC protection devices and associated electrical equipment, earthing systems, wiring, cable management accessories, safety signage, system labels, and all other components, fittings and accessories required for the complete installation, testing, commissioning and safe operation of the systems.



3. Technical Specifications

3.1. General Requirements

The contractor shall design, supply, deliver, install, test and commission complete solar-powered agro-processing systems consisting of milling and hulling equipment powered by stand-alone solar photovoltaic (PV) systems.

Each system shall be complete and shall include all equipment, accessories, fittings, cabling, protection devices, control equipment, mounting structures and ancillary works necessary for safe, reliable and continuous operation. The contractor shall be solely responsible for ensuring compatibility with all supplied equipment and for guaranteeing the overall performance of the complete system.

All equipment supplied shall be:

- New, unused and of current manufacture.
- Free from defects in design, materials and workmanship.
- Suitable for operation under Ugandan environmental conditions.
- Installed in accordance with the manufacturer's recommendations and good engineering practice.
- Comply with the **applicable IEC, ISO, EN or equivalent** internationally recognised standards.

3.2. Solar Hammer Micro mill

The contractor shall supply and install a complete solar-powered micro hammer mill suitable for commercial milling of maize and other cereal grains. The system shall include the milling machine, solar PV power supply, battery storage, charge controller, all protection devices, mounting structures, wiring, accessories, and ancillary equipment necessary for complete installation and operation. The proposed micro mill shall meet the following requirements.

3.2.1. Micro Hammer Mill

The micro mill shall meet the requirements in **Table 2** below.

Table 2: Specifications of the Micro Hammer Mill

Parameter	Minimum Requirement
Rated motor power	Minimum 1.0 kW
Motor technology	High-efficiency Brushless DC (BLDC), Permanent Magnet Synchronous Motor (PMSM), or equivalent DC motor
Nominal operating voltage	48 VDC
Milling capacity	Minimum 40 kg/hour for maize flour
Screen sizes	Interchangeable screens suitable for producing coarse meals, standard flour and fine flour
Motor Controller type	Compatible electronic controller supplied or approved for the proposed motor
Functions	Electronic soft start, speed regulation, overload protection, over-current protection, over-voltage protection, under-voltage protection, thermal protection, motor stall protection and fault indication
Warranty	2 years



3.2.2. Solar PV system for the Micro Mill

The solar system required to power the micro mill in **section 3.2.1** shall meet the requirements in **Table 3** below.

Table 3: Specifications of Solar PV System to Power the Micro Hammer Mill

Parameter	Minimum Requirement
Installed PV capacity	Minimum 600 Wp
PV module type	Monocrystalline or Polycrystalline modules certified to IEC 61215 and IEC 61730 or equivalent
Mounting structure	Corrosion-resistant roof-mounted structure
Battery chemistry	Lithium Iron Phosphate or equivalent lithium technology
Nominal battery capacity	Minimum 0.6 kWh
Nominal voltage	48 VDC
Battery cycle life	Minimum 3,000 cycles at 80% Depth of Discharge
Charge Controller type	Maximum Power Point Tracking (MPPT) solar charge controller compatible with the proposed PV array and battery system
Manufacturer's warranty	Solar panel: 10 years
	Charge controller: 5 years
	Battery: 5 years

3.3. Large Solar Powered Mills and Hullers

The supplier shall supply three (3) solar-powered milling systems and four (4) hulling systems.

The bidder may propose either:

- **Option 1:** Brushless Direct Current (BLDC), Permanent Magnet Synchronous Motor (PMSM), or equivalent DC motor-driven systems.
- **Option 2:** AC induction motor-driven milling and hulling systems; or

Regardless of the proposed technology, the bidder shall provide complete, fully integrated, and operational processing equipment and its solar PV system.

3.3.1. Milling Equipment

Each milling system shall meet the requirements specified in **Table 4**.



Table 4: Specifications of Milling Equipment

Parameter	Minimum requirement
Milling technology	Hammer mill or equivalent suitable for maize and other cereal grains
Rated motor power	Minimum of 1.3 kW
Processing capacity	60-250 kg/hour
Motor technology	AC induction motor or BLDC/PMSM/equivalent DC motor
Screen sizes	Interchangeable screens suitable for producing coarse meals, standard flour and fine flour
Warranty	Minimum 2 years
Continuous duty	Suitable for commercial operations
Safety guards	Required

3.3.2. Hulling Equipment

Each hulling system shall meet the requirements specified in **Table 5**.

Table 5: Specifications of Hulling Equipment

Parameter	Minimum requirement
Hulling technology	Suitable for rice and maize
Rated motor power	Minimum of 1.3 kW
Processing capacity	60-150 kg/hour
Motor technology	AC induction motor or BLDC, PMSM or equivalent DC motor
Warranty	Minimum 2 years
Continuous duty	Suitable for commercial operations
Safety guards	Required

3.3.3. Solar Photovoltaic (PV) Systems and Motor drive systems

The contractor shall design and install a dedicated solar PV system and motor control system for each of the Mills and Hullers which are specified in sections 2.2.1 and 2.2.2 above. The minimum requirements for each of the solar components and motor control systems are specified below.



A. Solar array

Table 6: Specifications of Solar Array for each processing equipment

Parameter	Minimum requirement
Installed PV capacity	≥ 2 kWp
Module Type	Monocrystalline or Polycrystalline
Certification	IEC 61215 and IEC 61730
Mounting type	Roof-mounted array
Mounting structure	Hot-dip galvanised steel or aluminium.
Fasteners	Stainless steel or corrosion-resistant
Product warranty	Minimum 10 years
Performance warranty	Minimum 25 years

Note: The contractor may offer larger PV capacities if justified by the proposed system design.

B. Battery Energy Storage System

Table 7: Specifications of battery system for each processing equipment

Parameter	Minimum Requirement
Battery chemistry	Lithium Iron Phosphate (LiFePO ₄) or equivalent lithium technology
Nominal battery capacity	Minimum 4.8 kWh
Nominal voltage	Compatible with the proposed system (minimum 48 V for DC motor systems)
Battery cycle life	Minimum 3,000 cycles at 80% Depth of Discharge (DoD)
Manufacturer Warranty	Minimum 5 years

C. Power Conversion and Motor Drive Systems

Option 1: DC Motor Systems

Where a DC motor is proposed, the contractor shall provide a complete DC motor drive system comprising:

- Solar PV array
- MPPT solar charge controller
- 48 V lithium-ion battery bank
- BLDC/PMSM motor controller
- DC motor
- Protection devices

The **MPPT charge controller** shall be appropriately sized for the proposed PV array and battery bank, be compatible with the battery chemistry, and incorporate, at a minimum, **Maximum Power Point Tracking functionality**, battery charging regulation, overcharge protection, reverse polarity protection, short-circuit protection, over-temperature protection, and **a minimum manufacturer warranty of 5 years.**



The motor controller shall have electronic soft start, speed control, overload protection, thermal protection, over-current protection, under-voltage protection, over-voltage protection and fault indication. It shall also be:

- Compatible with the proposed motor.
- Adequately rated for continuous operation.

Option 2: AC Motor Systems

Where an AC induction motor is proposed, the contractor shall provide a complete AC power conversion and motor drive system comprising: a solar PV array, hybrid Solar Inverter battery bank, motor starter, AC induction motor, protection devices, AC socket and plug. Minimum characteristics of the hybrid inverter are specified in **Table 8**.

Table 8: Specifications of hybrid inverter for the option of AC-powered processing equipment

Parameter	Minimum Requirement
Continuous output power	Minimum 3 kW
Output voltage	230–240 VAC
Frequency	50 Hz
Output waveform	Pure sine wave
MPPT charge controller	Integrated in hybrid inverter
Battery compatibility	Lithium-ion batteries
Efficiency	≥95%
Protection	Overload, short circuit, reverse polarity, over-temperature, over-voltage and low battery protection

Note: The inverter shall be capable of supplying both the continuous running current and the starting current of the proposed motor without nuisance tripping.

Where AC motors are proposed, the contractor shall provide:

- Direct-On-Line (DOL) Starter
- Soft starter or a Variable Frequency Drive (VFD), as appropriate.
- Thermal overload relay.
- Short-circuit protection.
- Lockable control enclosure.

The DOL starter shall be appropriately rated for the proposed motor (typically 7–20 A for motors within the specified power range).

3.4. Electrical Protection

Each installation shall include, as applicable:

- A DC Side consisting of a DC Isolator, DC fuse protection, type II DC surge protection device, UV-resistant solar cables and MC4 connectors or equivalent.
- An AC Side with an AC main isolator, miniature circuit breaker, type II AC Surge protection device, and distribution board.

The protection devices shall be coordinated and adequately rated for the proposed system.



3.5. Earthing System

Each installation site (enterprise) shall have one common earthing system serving both the solar-powered milling and hulling systems, irrespective of whether the systems utilise AC or DC motor technologies.

Three sites (Bumalema Traders, Dhero Group, Bugiri Crop Kings Ltd) have existing electrical earthing systems. For these sites, the contractor shall inspect, test and verify its suitability for the proposed solar PV installation.

Where the existing earthing system is found to be compliant with applicable standards and achieves an earth resistance not exceeding 5 Ω , it shall be integrated with the new installation through equipotential bonding. Where the existing earthing system is absent (at Youth for Life Tree Planting Ltd) or inadequate, the contractor shall install or upgrade the earthing system to meet the requirements specified below.

The common earthing system shall include the following as a minimum.

- Equipment earthing system for both the milling and hulling systems.
- Copper earth electrode(s), appropriately sized for the combined installation.
- Earth inspection pit(s).
- Copper earthing conductors.
- Earth clamps and bonding accessories.
- Equipotential bonding of all exposed metallic parts, including PV module frames, mounting structures, battery enclosures, inverters, MPPT charge controllers, motor controllers, processing equipment, distribution boards, industrial socket outlets, and metallic cable containment systems.
- Coordinated surge protection for both AC and DC circuits, as applicable.
- An external lightning protection system, where required based on a site-specific risk assessment or where existing infrastructure requires integration.

Where multiple earth electrodes are installed, they shall be interconnected to form a single integrated earthing network for the entire installation.

The completed earthing system shall comply with applicable national regulations and relevant IEC standards, and the measured earth resistance shall not exceed 5 Ω .

Each installation site (enterprise) shall have one integrated earthing system serving both the existing electrical installation (where applicable) and the solar-powered milling and hulling systems. All earthing electrodes shall be interconnected to form a single equipotential earthing network

4. Warranties and Operation & Maintenance

The contractor shall provide a minimum of a two (2) year warranty covering system installation, workmanship, and defects. This shall include parts, labour, transportation, and all costs associated with repairs or component replacement during this period. **As part of your proposal, please include a brief outline of your operation and maintenance strategy for the two-year warranty period.**

All warranty certificates/documents (system and components) shall be issued and handed over to GIZ Uganda.



5. Key Deliverables

The contractor shall provide the following deliverables.

5.1. Work plan

Submit a detailed implementation work plan to GIZ within five working days of signing the purchase order. The work plan shall cover equipment delivery, installation, testing, commissioning, operator training, handover for each project site, key milestones, timelines, and any critical activities.

5.2. Installation and Commissioning Report

After completion of the work, the contractor shall submit an installation report containing, but not limited to

- i. Detailed system description and components installed on each site.
- ii. Photographic evidence of the completed solar PV installation and user training sessions; names and contact details of the two individuals/operators trained per site
- iii. Site-specific technical notes like any challenges encountered during installation or commissioning or future recommendations.
- iv. Any other relevant information from the works performed.

6. Onsite System Labelling

A solar PV system wiring diagram sticker must be affixed on an appropriate space/place onsite, clearly showing the solar PV system and processing machine layout (modules, inverter, battery configuration and the appliance (mill/huller). The contractor shall place warning and guidance labels or stickers at appropriate locations at the power station/ processing site for safe operation and avoiding misuse/overuse of solar equipment and appliances.

7. Bidder's technical and financial proposal

Bidders shall submit a brief technical proposal describing their proposed approach to the supply, delivery, installation, testing, commissioning, training, warranty and after-sales support of the solar-powered agro-processing systems. The proposal shall include, at a minimum, a brief description of the proposed system design and configurations, proposed equipment and key components, and work schedule, and details of the bidder's warranty and operation and maintenance approach.

Attach all relevant specification sheets/data sheets for the proposed system components.

Bidders shall also submit a completed financial proposal using the **Financial Proposal template/ Bill of Quantities template provided with this ToR.**



8. Appendix

Installation site photos



Figure 1: Proposed processing facility for housing solar-powered agro-processing equipment at **Bumalema Traders Ltd, Mbale**



Figure 2: Proposed processing facility for housing solar-powered agro-processing equipment at **Bugiri Crop Kings Ltd, Bugiri**





Figure 3: Proposed processing facility for housing solar-powered agro-processing equipment at **Youth for Life Tree Planting Ltd, Lira**



Figure 4: Proposed processing facility for housing solar-powered agro-processing equipment at **Dhero Group Ltd, Jinja.**

