

### Initial irrigation design data

Key Metrics	Oromia			SNNP			Amhara			Total All Sites
	Huluku	Chefe Kora	Dalle	Moko	Murche	Lelicho	Telifa	Aregawi	Andega	
<b>Gross Farmland Area (ha)</b>	526	200	292	339	473	519	459	105	305	3218
<b>Actively Irrigated Area (ha)</b>	167	48	232	299	341	312	333	98	231	2061
<b>Mini-grid Irrigation Service Area (ha)</b>	250	200	292	122	407	87	438	105	235	2136
<b>Design Irrigated Area (ha)</b>	140	100	150	130	250	79	263	63	150	1325
<b>Design Simultaneously Irrigated (ha)</b>	72	52	77	50	133	51	91	47	56	629
<b>Water source</b>	Ground water	Groundwater	Ground water	Surface	Ground water	Surface	Ground water	Ground water	Groundwater	
<b>Number of pumps</b>	12	7	5	4	14	4	13	4	8	
<b>Pump Flow Rate (m3/h)</b>	77	94	161	160	96	84	94	160	94	
<b>Pump Lift (m)</b>	73.1	72	79.68	43	43.82	160	72	43	72	
<b>Pump Power Demand (kW)</b>	25.6	30.9	55.8	25.2	19.7	55.9	30.9	25.2	30.9	
<b>Hectares per Pump</b>	20.8	28.6	58.4	30.5	29.1	21.8	33.7	26.3	29.4	30.1
<b>Site Electric Demand (kW)</b>	295	207	268	97	264	215	385	97	237	2066
<b>Well Depth (m)</b>	58	75	149	0	49	0	76	131	76	60

*\*Mini-grid Irrigation Service Area (ha): this is the gross (may include non-farmable land). The determination of irrigated hectares is based on analysis of 6 years of satellite imagery for each site.*

*\*Design Irrigated Area (ha): this is the hectares out of the gross irrigated area that formed the design basis.*

*\*Well depth: This is the average bore hole depth for the wells in the site. Sites with a lot of topographic relief, e.g. Lelicho, have considerable variation in depth among wells.*

*\*Wellbore/casting diameter (inches): First number is the well borehole diameter / second number is the casing diameter*



**Initial bill of quantities and specification for goods to be procured**

*initial bill of quantities per site and technical specification for selected/key irrigation equipment*

<b>Major Irrigation Components</b>	<b>Irrigation Item</b>	<b>Specification</b>
<b>Pump and well infrastructure</b>	<i>Submersible electric pumps</i>	<i>Motors must be rewindable (so they can be repaired in Ethiopia). Motors must also be compatible with variable frequency drives. Motors must have a minimum efficiency of &gt;83% at rated speed. Overtemperature protection is required with temperature sensors for monitoring. Pump bowls and impellers and motor housing must be stainless steel. Pumps must have a minimum efficiency &gt;78% per stage at best efficiency point (BEP). Pumps must have a non-return valve. Overall efficiency of the motor and pump including all stages and non-return valve must be &gt; 63% at the BEP</i>
	<i>Well riser pumps</i>	<i>The cost estimate here is for Sch 120 PVC threaded riser pipe</i>
	<i>River Pump Station (for surface water source)</i>	<i>Cost includes all civil works and piping, including filters, for river pump stations</i>
	<i>River Pump</i>	<i>Vertical Turbine pump, water discharge 44.4 l/s, pressure H=43 m with 40-hp Nidec 1800 rpm electric motor Pump similar to Franklin Electric 11FHC-1C-2SS-08W-03-ACO-A Vertical Turbine Pump. Motor Similar to Nidec 40 HP 1800 RPM 460 PWS V VHS WP1 324TP Premium Efficient (94.1%) Supply, install, pipe and electrical tie-in, test, and operate. Efficiency (pump) 84.76% Premium Efficient Motor (94.1%)</i>
	<i>Pump flow meter</i>	<i>Flow meter for measuring pumped water flow rate and cumulative volume with digital pulse output compatible with power meter at power drop. This is an important component for managing water, monitoring pump and well performance, and assuring electrical power is being used to pump water</i>



<p><i>Pump/well monitoring and control equipment*</i></p>	<p><i>Per Odyssey/FernTech specifications and equipment listed each well and pump station will be equipped with:</i></p> <ul style="list-style-type: none"> <li>- Modem (SIM not included)</li> <li>- Datalogger/controller</li> <li>- AC/DC Power supply (230Vac)</li> <li>- pulse counter (for interface with the water flow meter)</li> <li>- 4...20mA transducer</li> <li>- 3ph AC power meter + 3 x 75A Current transformers</li> <li>- relay output</li> <li>- 250 A 3ph contactor (600Vac)</li> <li>- accessories (wires, fuses, connectors..)</li> <li>- IP55 Enclosure</li> <li>- wiring and testing tasks in the warehouse</li> </ul>	
<p><i>Variable Frequency Drive (VFD)</i></p>	<p><i>Supply and install variable frequency drive motor control units in minimum protection IP55 enclosure. 98% efficiency at full load</i></p>	
<p><b>Distribution infrastructure</b></p>	<p><i>HDPE pipes</i></p>	<p><i>50 m pipe per well Prices to include pipe, transport to site, pipe fittings, and installation</i></p>
	<p><i>Field Group Irrigation Distribution System</i></p>	<p><i>Durable 4" layflat hose distribution. Cost per hectare is derived from sample layouts</i></p>
	<p><i>Portable flow meters</i></p>	<p><i>Rugged flow meter at one per lateral</i></p>



