Prototyping Application

What is your assigned team number?
-> 2022-31

Please state the name of your university:
-> University of Nairobi
Please state your full name:
-> Donatus Omondi Ochieng
Please state your email address:
-> donatus1@students.uonbi.ac.ke
This will be the primary student contact of your team

Please state your supervising academic's/educator's full name:
-> Kinyua Wachira
Please state your supervising academic's/educator's email address:
-> kwachira@uonbi.ac.ke
What is the name of your project?
-> Automated Hydroponic Vertical Farm
Please enter the name of your project as per your concept note submission

Needs Statement:
Why we require funding
Our Aims of the Prototype are:

- To adopt better utilization of available water and land resources to obtain farm produce in the unforgiving weather conditions.
- To develop such an affordable automated vertical hydroponic structure.

Our target market includes farmers, people who lack farming land and people with limited access to water.
Available local hydroponic alternatives require some bit of land and labor and the water reuse system is not well set up. If we manage to make a rather small prototype which will occupy about 1 square meter of space and 1.5m of height, have a good water reuse in place, have a good plant capacity of about 20 plants, require minimal supervision, be off-grid and have a cost of about $150, then, this would be a very appealing product.
Making such a product modular will allow easy repair and packaging and will thus be more durable.

This is what we are aiming for with the prototype, it may not be exact as we plan but it can come very close.
Building such a prototype however will require us to employ 3D printing. Our lack of a 3D printer and printing filament thus brings about a big cost barrier to us being able to implement such a prototype.
We thus will really really appreciate funding of such a prototype as it really would not be possible without it.
With the funding we will be able to realize the full potential of such a prototype and make it possible for us to effect our aims of better water and land utilization at an affordable cost.

How we will spend the prototype fund
We have divided our project requirements into categories and the prototype fund will be used to purchase the items to support these categories:

- Structure
    - Here we are planning to buy a basic yet powerful 3D printer as well as the printing filament.
    - This will be used to print majority of the tower structure and this will hold the plants
- Water
    - Here we are planning to buy a simple submersible water pump with a lift of 2m and a good enough flow rate to ensure the plants are well watered.
    - A 20L bucket will also be bought which will form the water reservoir.
    - A hose from the pump to the top of the tower structure will also be required.
- Plants
    - To handle plants the seeds, nutrient solution, rock wool as well as other required items will be bought. The seeds and nutrient solution are the main items.
- Control
    - To control the pump as well as take readings from the tower we plan to buy 2 Raspberry Pi Pico W's. For the prototype a simple IoT methodology will be used to enable us obtain operation data even remotely.
- Power
    - An off-grid power supply setup will be purchased. This will require a solar panel, battery and charge controller.
- Extras
    - These involve perf-boards, bread boards, voltage regulators for the MCU's, connecting wires etc.

We plan on purchasing everything required for the project as soon as we receive the fund, which we will really appreciate.
Priority of purchase will be on equipment that may not be locally available such as the 3D printer as it may take time to be delivered.
We plan on working our implementation based on what will be obtained first. We also plan on finalizing on any programming and designing work even before the time the funds will be issued just to be ready to continue well with the build.

What we predict the impact of your prototype will have
We predict that our prototype will really raise awareness on the benefits of vertical hydroponic farms. Using this prototype we can engage the community and hear on their feedback on such innovative actions.
With a little more help such simple implementation can really go mainstream as agriculture is practiced by most people.
We predict that the prototype will bring market anticipation for such a product. This can range from farmers to people who aren't farming but are looking for better ways to farm.
We predict the prototype will bring us a step closer to a nation's better utilization of available water and land resources to obtain farm produce in the unforgiving weather and thus contributing towards SDG 7 whereby access to clean and affordable energy for agricultural development is ensured.

Budget

Total funding in US dollars ($):
-> $ 1032.25

Item Number	Item Description	Link to item/quote where appropriate	Quantity	Unit Cost	Cost
1	Ender-3 V2 Neo 3D Printer	https://store.creality.com/products/ender-3-v2-neo-3d-printer?spm=..collection_6441e458-3e77-43ed-baf5-2671b3222c52.albums_1.1&spm_prev=..product_3b800a4d-f62b-4ceb-980e-a75d007c37d8.header_1.1	1	$299.00	$299.00
2	1.75mm 1Kg White	https://www.pixelelectric.com/3d-printer-cnc-parts/filaments/petg/1-75mm-1kg-white-petg-filament/	5	28.67	143.35

	PETG Filament				
3	JT-180 12V DC Water Pump 350L/H Submersible Pump	https://www.pixelelectric.com/more-categories/other-accessories/liquid-pumps/jt-180-12v-dc-water-pump-350l-h-submersible-pump/	1	15.09	15.09
4	Bucket 20L	https://copia.co.ke/product/star-paint-bucket-20l-green/	1	1.51	1.51
5	Nutrient Solution A&B 1kg	https://www.hydroponicsafrica.org/	2	7.54	15.08
6	Seedling Tray	https://jiji.co.ke/nairobi-central/farm-machinery-equipment/seedling-tray-Cvl2HEcMDksGsmdMOU48mD5g.html	2	0.98	1.96
7	Net Cups	https://jiji.co.ke/nairobi-central/farm-machinery-equipment/hydroponic-net-pots-for-vegetable-and-flower-growing-93S37dwtZacrNYgclWyqHhm3.html	20	0.23	4.6
8	Rock wool pods set 1 m x 30cm	https://jiji.co.ke/nairobi-central/feeds-supplements-seeds/rockwool-for-hydroponic-farming-soilless-potting-medium-oOKrnkT5OQeJkf3WkbyIvkup.html	1	7.17	7.17
9	Solar Panel 40W 18V Monocrystalline	https://www.pixelelectric.com/electronic-modules/miscellaneous-modules/solar-panel/40w-18v-monocrystalline-solar-panel/	1	28.67	28.67

10	Solar Battery - Lead Acid Battery - 12V 7Ah	https://www.pixelelectric.com/more-categories/lead-acid-battery-12v-7ah/	1	11.32	11.32
11	20A LCD Dual USB Solar Charge Controller	https://www.pixelelectric.com/electronic-modules/miscellaneous-modules/solar-panel/20a-lcd-dual-usb-solar-charge-controller/	1	11.32	11.32
12	Raspberry Pi Pico W MCU	https://shop.ivyliam.com/product/pi-picow/	2	9.05	18.1
13	Sim900 Mini V4.0 Wireless Data Transmission Module Gsm Gprs Board Kit W/antenna C83	https://askelectronics.co.ke/product/sim900-mini-v4-0-wireless-data-transmission-module-gsm-gprs-board-kit-w-antenna-c83/	1	15.09	15.09
14	5V 4 CH OMRON SSR Solid Relay	https://www.pixelelectric.com/electronic-modules/miscellaneous-modules/relay-switch/5v-4-ch-omron-ssr-solid-relay-module/	1	7.54	7.54

	Module DC-DC				
15	LM2596HVS-ADJ Step-down 5V regulator	https://www.pixelelectric.com/more-categories/electronic-components/passive-components/transistor-mosfet/lm2596hvs-adj-step-down-5v-regulator/	2	0.75	1.5
16	Schottky Diode 1N5	https://www.pixelelectric.com/electronic-components/passive-components/diode/schottky-diode-1n4-1n5-uf4-fr2-rl2/	2	0.15	0.3
17	Inductor 68uH	https://store.nerokas.co.ke/index.php?route=product/product&product_id=890&search=Inductor&description=true	2	0.19	0.38
18	Resistor 1kohm	https://www.pixelelectric.com/more-categories/electronic-components/passive-components/resistor/resistor-1-120m-ohm-1-4w-5/	2	0.02	0.04
19	Potentiometer 10kohm	https://www.pixelelectric.com/more-categories/electronic-components/passive-components/potentiometer/trimpot-potentiometer-variable-resistor-500r-1m/	2	0.08	0.16
20	Capacitor 470 uF	https://www.pixelelectric.com/electronic-components/passive-components/capacitor/0-22uf-2200uf-radial-electrolytic-capacitor/	2	0.3	0.6
21	Capacitor 220uF	https://www.pixelelectric.com/electronic-components/passive-components/capacitor/0-22uf-2200uf-radial-electrolytic-capacitor/	2	0.3	0.6
22	Jumper wires 40pcs set	https://www.pixelelectric.com/instruments-tools/wire-and-cables/cables/dupont-jumper-cable/65pcs-jump-wire-cables-male-to-male/	2	1.13	2.26
23	Breadboard	https://www.pixelelectric.com/instruments-tools/wire-and-cables/bread-pcb-board-copper-clad/breadboard-mb102-crystal/	2	1.51	3.02

24	Soldering wire 1 roll	https://www.pixelelectric.com/instruments-tools/tools/soldering-tools-kits/1-0mm-100g-rosin-core-solder-63-37wire/	1	5.66	5.66
25	Soldering gun 60w	https://www.pixelelectric.com/instruments-tools/tools/soldering-tools-kits/60w-220v-soldering-iron-adjustable-temperature/	1	6.04	6.04
26	Soldering gun stand	https://www.pixelelectric.com/instruments-tools/tools/soldering-tools-kits/soldering-iron-stand/	1	1.89	1.89
27	Perf-board	https://www.pixelelectric.com/instruments-tools/wire-and-cables/bread-pcb-board-copper-clad/veroboard-stripboard-6-5cm-x-14-5cm/	2	0.38	0.76
28	Single Core Wire 1m	https://www.pixelelectric.com/instruments-tools/wire-and-cables/bread-pcb-board-copper-clad/veroboard-stripboard-6-5cm-x-14-5cm/	5	0.62	3.1
29	Analog pH Sensor / Meter Kit	https://www.pixelelectric.com/sensors/load-pressure-flow-vibration/water-tds-ph-flow-level-sensor/analog-ph-sensor-meter-kit/	1	22.63	22.63
30	1M PVC Hose Pipe for Pumps	https://www.pixelelectric.com/more-categories/other-accessories/liquid-pumps/1m-pvc-hose-pipe-for-pumps/	2	0.45	0.9
31	Spinach Seeds 50g	https://www.simlaw.co.ke//product-details/858/11204	1	1.06	1.06
32	Kale Seeds	https://www.simlaw.co.ke//product-details/602/159	1	1.55	1.55
33	Shipping Cost and Customs for 10kg	https://kentexcargo.com/	10	20	200

	3D printer				
34	Currency Variations and Transaction costs from EFA team to University to Us	N/A	1	200	200
Add more lines above if necessary					
				Total	$ 1032.25