

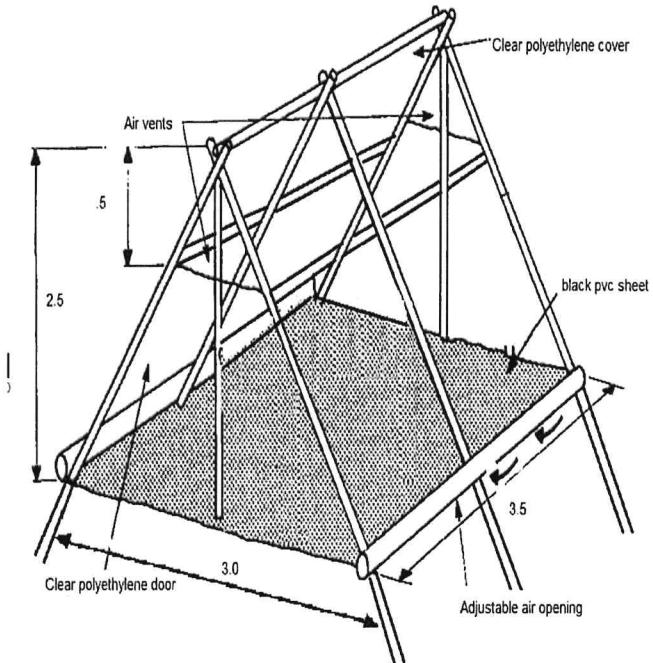
PROJECT PROPOSAL

I. PROJECT PROFILE	
A. Title of the Project	Development, Performance Evaluation and Utilization of Tiger Grass Postharvest Technologies in Romblon
B. Proponent	Romblon State University, Office of the Research Director
C. Project Cooperators	Tiger Grass Processors in the Marigondon Norte, San Andres, Romblon
D. Project Duration	1 year project implementation 2 years monitoring of outcomes
E. Total Project Cost	PhP 977,102.97 DOST MIMAROPA - PhP 772,702.97 RSU – PhP 204,400.00
II. PROJECT PROPOSAL	
A. Rationale	<p>The million peso tiger grass industry in Romblon is in need of technologies to aid in processing the commodity. A package of postharvest technologies will be developed for drying, pollen removing and for designing a green broom. The technologies will aid the processing industry workers lighten their jobs.</p> <p>Previous studies on tiger grass processing industries identified the need for technologies that will help the processors in drying the flowers, removing the pollens and improve the softbroom designs.</p> <p>Harvesting of tiger grass starts November and ends in May. Farmers rely on the sunlight and the pavement for drying and problems occur during intermittent rains. If not properly dried, tiger grass becomes infested with fungus that discolors the inflorescence and result to low price in the market. The farmer therefore resort to selling their harvests to accumulators who have the storage facility and the means to hire persons to dry the tiger grass.</p> <p>To address these problems, bamboo connectors will be used as a potential alternative for the conventional construction materials in putting up a solar dryer. The immediate resource in the rural areas, simplicity and economics of construction are among the numerous factors to consider in utilizing bamboo. The stakeholders, farmers and other interested party may benefit from the utilization of the product because of its economic value and efficiency.</p> <p>The existing pollen remover designed by DMMSU and RSU were seldom used by the farmers due to its bulk, weight and power requirement. Some units delivered to the communities were shared but farmers do not like the idea of bringing their harvests to the centers due to distance and terrain issues. The high cost of the ownership prevents the individual farmers from owning a unit of pollen removing machine.</p> <p>Thus, there is a need to develop a machine that is easy to operate, portable and cheap that even small-time farmers can avail. It has been reported that the farmers opted to sell their produce rather than processing them because of the tedious task of removing pollens. Likewise, the existing pollen remover machine is beyond the means</p>

	<p>of the farmers to afford.</p> <p>Disruptive technology is defined as one that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new industry (Rouse 2016). This is the kind of technology that will be explored by this project because traditional broom have persisted through time without innovation in terms of design and packaging.</p>
B. Project Description	<p>The research will come up with innovative postharvest technologies for drying tiger grass inflorescences, pollen removing and redesigning of soft brooms using waste materials and will have handles that are refillable, sleek and may be folded for easy transport. It will also include an appropriate packaging for the product. These technologies will undergo testing and evaluation across parameters that will vouch for their efficiency as compared to the prevailing postharvest practices and methods of the commodity.</p>
C. Objectives	<p>The general objective of this research is to develop innovative postharvest technologies for tiger grass industry in Romblon and test their efficiency and feasibility.</p> <p>Specifically, it intends to:</p> <ol style="list-style-type: none"> 1. Develop and test the performance of a tiger grass dryer using bamboo connectors. 2. Develop and test the performance of a compact and DC operated tiger grass pollen remover 3. Develop a "disruptive" broom design and test its quality and market performance 4. Empower tiger grass farmers to harvest, dry, clean and store their tiger grass and command a premium price to their produce 5. Value addition will be at the hands of farmers as they convert the tiger grass into brooms that they could bring to the market themselves. 6. Provide appropriate P&L to the product to give value and price. 7. Increase farmer's productivity 8. Generate DOST 6PS for research project (product, people, partnership, protection, publication and policy)

D. Methodology

Component 1: Development and Test Performance of Tiger Grass Dryer using Bamboo Connectors



Note: Modification from the existing miniature shall be made by using bamboo connectors with additional features of horizontals across the frames and additional layers of drying mediums, adjustment in coverage area and the height of the drying mediums.

Research will be conducted in Marigondon Norte, San Andres, Romblon by the Agricultural Engineering Department of the College of Engineering and Technology to at least three tiger grass processors.

The Conceive, Design, Implement and Operate (CDIO) framework will be used in the development of the technology. Existing literatures on drying facilities related to tiger grass will be reviewed along with the procedure for performance testing. The drying facility will be developed considering the suggestions from literature especially on the utilization of bamboo connectors. The implementation phase will be conducted carefully following the design.

Below is the working Equation for Drying.

Drying Capacity

$$Cd = (Wi/Td)$$

Cd – drying capacity, kg/hr

Wi – initial weight of the material, kg

Td – drying time in hr

da

da

Final Weight of Dried Material

$$Wf = (Wi(100-Mci))/((100-Mcr))$$

Efficiency

Wf – final weight of dried material, kg

Heat Supplied to the Dryer

$$Qsd = (60(h2-h1)AR)/\gamma$$

Qsd – heat supplied to the dryer

H2 – enthalpy of drying air, KJ/kg

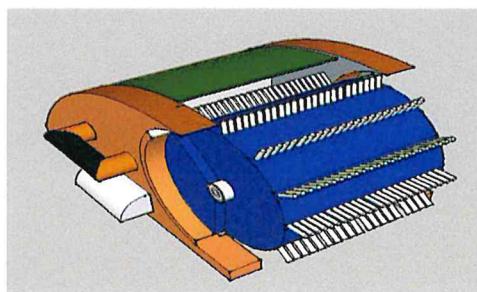
H1 – enthalpy of ambient air, KJ/kg

AR – airflow rate, m³/min

γ – specific volume, m³/kg

Heat System

$$\xi_{hs} = (Qsd)100/Qaf$$

	<p>Wi – initial weight of material, kg Wci – initial moisture content, % KJ/hr Wcf – final moisture content, % KJ/hr</p> <p>Moisture Reduction per Hour</p> $MRR = (wi-wr)/Td$ <p>MRR = moisture reduction rate kg/hour Wi – initial weight of material, kg KJ/hr Wf – final weight, kg Td – drying time in hr removed, kg</p> <p>Heat Utilization Efficiency</p> $\xi hu = (THU \times 100)/Qsd$	<p>ξhs – heating system efficiency, % Qsd – heat supplied to the dryer, Qaf – heat available in the fuel,</p> <p>Heat Utilization</p> $\xi hu = (Qsd \times Td / MR)100$ <p>HU – heat utilization, KJ/kg Qsd – heat supplied to the dryer, Td – drying time, hr MR – amount of moisture</p> <p>ξhu – heat utilization efficiency, % THU – total heat utilized, KJ/hr Qsd – heat supplied to the dryer,</p>
<p>Tests of the dryer using bamboo connectors will be made at the College's testing laboratory. Simulated dead loads and wind loads will also be made for frame analysis of the structures. The connectors will likewise be tested in actual construction work of structures it will be intended for. A research paper will be developed for purposes of presentation in scientific or professional gathering, local, regional, national and even international. Patent for the technology and construction method would be other outputs of the research.</p>		
<p><u>Component 2: Compact and DC-Operated Tiger Grass Pollen Remover</u></p>		
		
<p>This research will be conducted at the Romblon State University, Main Campus at the Metal and Woodworking school factory of the College of Engineering and Technology.</p>		
<p>The pollen remover will be an automatic, portable and DC operated intended for Tiger grass producers of San Andres, Romblon.</p>		
<p>The frame or body of the Automatic Tiger grass pollen remover will be made of plywood for the ease of transport and to reduce the cost of the machine to be affordable.</p>		
<p>The pollen remover cylinder assembly has holes where the nylon is inserted at a specified spacing.</p>		

The motor that will be used is a 24V, 2700 rpm, 14 amperes maximum, and 250 watts, with a DC motor controller to drive the cylinder at a specifically required speed. The power from the DC motor will then be transmitted by a chain drive and two chainrings (36 and 16 teeth)

The system will use a 24-Volt battery with a capacity of 64AH (Ampere-hour) which is more than enough to power up the machine. For the better battery capacity of the machine, the converter charger that can fully recharge the battery in just 2 hours will be used. The efficiency of the machine is determined based on the number of stalks finished over the specific time. The number of damaged stalks in that specific time will also be recorded.

To optimize the machine, the proponents will use the Bex-Behnken Design. It is an independent quadratic design in that it does not contain an embedded factorial or fractional factorial design. In this design, the treatment combinations are at the midpoints of edges of the process space and the center. These designs are rotatable (or near rotatable) and require 3 levels of each factor.

The selected independent variables/factor are:

1. The Rotation of the cylinder in Revolution per Minute (A)
 2. The size of the Nylon to be used (B); and
 3. The spacing among the nylons in the Cylinder Assembly (C).
- The Design Expert Statistical Software will be used to generate the number of runs/experiment.
- The Response (dependent) Variable to be optimized will be the Efficiency of the machine.

Factor	Name/Unit	Low Level	Middle Level	High Level
A	RPM	-	-	-
B	# of Nylon	-	-	-
C	Millimeter	-	-	-

The machine will be tested based on the following standards:
PNS/PAES 103:2000 Agricultural Machinery – Method of Sampling
PNS/PAES 138:2004 Agricultural Machinery – Guidelines on After Sales Service
PNS/PAES 263:2015 Agricultural Machinery – Multipurpose Thresher – Methods of Test.

Component 3: Disruptive Broom Design

The development research will be conducted at Romblon State University. Development will follow the CIDT framework.

Conceptualization will involve looking for solution to the existing condition of the tiger grass industry players. Ideation will be based on the appropriate design that would best fit the perceived problem of marginalization in the industry. Ideation will also be made in line with the desire to make farmers increase their productivity by maximizing potential of their product by actually doing the processing

	<p>and value addition themselves. Ideation will also consider the value that the product will give to consumers in terms of addressing issues met by consumers in using brooms. Development of the broom will be made at the College of Engineering and Technology. The development process will follow what had been ideated. The development will not only entail the product but also the process of making into reality the blueprint made during ideation. The processes involved will be designed so as to create the broom that would have standard content and properties. The product must be amenable to optimal packaging and shipping and must create the maximum profit to producers. New materials that were not usually used but are cheap and readily available will be introduced in the product. Moreover, the product will utilize materials that will reduce the total carbon footprint of the broom and may also possibly reduce the same carbon footprint for other industries. The prototype broom will be tested to determine its mechanical property. A simple contraption will be made for the test in the absence of a Universal Testing Machine.</p> <p>Once the “disruptive” design is developed, a simulated broom factory will be created so as to test the design in a “production line.” Brooms will be developed in a time and motion study and the study adopted in a school factory “production line” setting. Furthermore, sweeping capability, portability, and design ergonomic impact will be tested.</p>																																																																																			
E. Business Plan	<p>These technologies will be an addition to the RSU-CET woodworking school factory or any taker, especially from the furniture industry for the frame, the rotating drum and the disrupted broom design. But before this would be spun off, intellectual property for the patent, utility model, industrial design (whichever will apply) will be made first. Spinning off will be governed by the technology transfer manual of the university if existing. Otherwise, the school factory will be utilizing the design and process for the benefit of the university. The researchers may be allowed to share profits from operations as defined by the IGP manual of the university.</p>																																																																																			
F. Activity Schedule	<p>The following timetable will be followed:</p> <table border="1"> <thead> <tr> <th rowspan="2">Activity</th> <th>2020</th> <th colspan="3">2021</th> <th>2022</th> <th>2023</th> </tr> <tr> <th>3-4Q</th> <th>1Q</th> <th>2Q</th> <th>3Q</th> <th>4Q</th> <th></th> </tr> </thead> <tbody> <tr> <td>Consultation and meeting</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Project proposal preparation</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Project proposal review</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Revision, approval and MOA signing</td> <td>X</td> <td>X</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fund release</td> <td></td> <td>X</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Procurement of equipment & supplies</td> <td></td> <td></td> <td>X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Implementation</td> <td></td> <td></td> <td>X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Completion and report preparation</td> <td></td> <td></td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>Liquidation</td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td></td> </tr> <tr> <td>Report presentation</td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td></td> </tr> </tbody> </table> <p>Monitoring and evaluation would be made by the PSTC so that the performance objectives and other deliverables will be attained.</p>	Activity	2020	2021			2022	2023	3-4Q	1Q	2Q	3Q	4Q		Consultation and meeting	X						Project proposal preparation	X						Project proposal review	X						Revision, approval and MOA signing	X	X					Fund release		X					Procurement of equipment & supplies			X				Implementation			X				Completion and report preparation			X	X	X	X	Liquidation					X		Report presentation					X	
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G. Budget Breakdown	The following line-item-budget would be followed for the project:		
ITEM	DOST-GIA (P)	RSU (P)	
MOOE Travelling Expenses Training Expenses Supplies and Materials (breakdown attached in separate sheets) Other Professional Services P1,400/day x 2days x 2weeks x 12mos 4 researchers Representation Transportation and Delivery Expenses	20,000.00 246,302.97 134,400.00 7,000.00 15,000.00	60,000.00 10,000.00 134,400.00	
Equipment Outlay MIG welding Machine with complete accessories / suitable for metal construction / input voltage: single phase / rated input power: 6.1kVA / output current range: 50- 200A / output voltage range: 16.5-24V	90,000.00		
SMAW with generator / welding process: MMA/TIG / welding voltage: 22-25V / fuel: diesel / fuel capacity: 25 liters / air cooling	200,000.00		
Sliding compound miter saw / Continous rating input: 1,800W / Blade Diameter: 305 mm (12") / Max Cutting Capacity: at 90° 92 x Length 382 mm / Bevel angl: 48° L / 48° R / No-load speed: 3,200 rpm / Net weight: 26.6kg (58.6lbs) / LS1219 305mm Slide Compound Mitre Saw / Unique 2-Steel Rail Sliding System Design Allows Operation Flush Against a Wall / Increased capacity for up to 203 mm (8") crown moulding (vertically nested), 171 mm baseboard (vertical), and 382 mm crosscuts at 90° / Dual dust collection ports provide excellent dust extraction performance / In-front bevel lock for convenient operation / Large turn base supports workpiece securely for increased stability / Mitres 0-60° left and right; bevels 0-48° left and right / Positive mitre stops at: 0°, 15°, 22.5°, 31.6°, 45°, and 60° left or right / Electric brake for maximum productivity	60,000.00		
Existing equipment and facilities at the WSF		(2,200,000)	
Total	772,702.97	204,400	

	The RSU counterpart would be travel of faculty to present the paper and office supplies for preparation of manuscript, reports and liquidation. It will also shoulder the honorarium of two other researchers because the project has three components.
H. Project Management	The project will be managed by the DOST PSTC Romblon. It will be implemented by the Office of the Vice President for Research, Extension and Development in cooperation with faculty from the RSU-CET. Financial matters will be handled by the RSU Administrative and Finance Services offices.
I. Expected Output	<p><i>Products.</i> The products that would come out from this research are tiger grass dryer using bamboo connectors, a compact and DC operated tiger grass pollen remover and a disruptive broom design.</p> <p><i>People.</i> One master's degree graduate will be considered for this research. This will come from a faculty co-operator of this research. This will also open opportunities for farmers and processors to convert their produce into brooms that they could bring to the market themselves consequently leading to the creation of new jobs.</p> <p><i>Places and partnerships.</i> Partnerships with tiger grass processing industry sector will be made.</p> <p><i>Publication.</i> At least one paper for publication in a Scopus- indexed journal will be considered. Another knowledge product that could be copyrighted is the documented process for producing the bamboo laminates.</p> <p><i>Protection.</i> An application for patent, utility model or industrial design, whichever is applicable, for the protection of intellectual property will be made.</p> <p><i>Policy.</i> Once implemented and spun off, a policy for using tiger grass as a reforestation species for the national greening program will be lobbied in the local governance.</p>
J. Monitoring and Evaluation	Monitoring and evaluation will be made by the DOST PSTC Romblon. Monitoring and evaluation will be centered on project deliverables as listed in the expected output.

BREAKDOWN OF SUPPLIES AND MATERIALS

Component 1: Development and Test Performance of Tiger Grass Dryer using Bamboo Connectors

Quantity	Unit	Particulars	Unit price (PhP)	Total Amount (PhP)
24	pcs	Bamboo, big	180.00	4,320.00
30	pcs	Bamboo, small	120.00	3,600.00
9	pcs	Connector, A frame	270.00	2,430.00
54	pcs	Connector, cross	120.00	6,480.00
12	pcs	Connector, T	120.00	1,440.00
10	kilos	Tying wire	80.00	800.00
1	box	Blind rivets	300.00	300.00
100	pcs	Blind rivets, 1/8 X 3/4 in	0.80.00	120.00
100	pcs	Blind rivets, 5/32 x 1/2	1.00	400.00
1/4	kg	Washer	160.00	40.00
36	pcs	Washer, 5/32	0.50.00	18.00
75	yard	UV resistant plastic sheet, 1.5 mm	110.00	8,250.00
4	bags	Cement	250.00	1,000.00
1	M ³	Gravel	1,000.00	500.00
1	M ³	Sand	1,000.00	500.00
3	liter	Paint	180.00	540.00
3	pcs	Paint brush	40.00	120.00
1/2	kg	Nails, 1 in	40.00	40.00
1	kg	Nails, 2 1/2 in	80.00	80.00
1/2	kg	Nails, 1 1/2 in	80.00	40.00
1/2	kg	Nails, 3 in	80.00	40.00
1	pc	Drill bit	120.00	120.00
1	pc	Steel bit, 5/16 in	240.00	240.00
6	pcs	Shelf racks	651.97	651.97
1	pc	GI Pipe	4,000.00	4,000.00
2	clip	Nylon	10.00	20.00
1	pc	Cross cut saw	550.00	550.00
1	pc	Electric grinder	2,000.00	2,000.00
3	pc	Iron saw	90.00	270.00
1	pc	Electirc Drill	2,000.00	2,000.00
1	ps	Exhaust fan	5,100.00	5,100.00
1	pc	Weighing scale	1,200.00	1,200.00
1	pc	Anemometer	1,000.00	1,000.00
1	pc	USB flash drive	400.00	400.00
2	pcs	Battery	90.00	90.00
TOTAL COST				PhP48,699.97

Component 2: Compact and DC-Operated Tiger Grass Pollen Remover

Quantity	Unit	Particulars	Unit price (PhP)	Total Amount (PhP)
Materials				
2	pc	Marine Plywood(3/4 in thick)	884.00	1,768.00
3	pc	24V DC Brushless Motor (High Torque), 350 W	2,887.00	8,661.00
3	set	15T-38T X 428-112L) Osaki Revo Chain and Sprocket Set (Chrome)	1,347.00	4,041.00
12	pc	Bolts and Nuts steel ($\varphi = 1/4$ inch)	50.00	600.00
6	pc	FK 4 Holes Flange Bearing UCF 205-16 (1/4")	72.00	432.00
1	box	Welding Rod - 3/32 Inch x 300mm (3/32 Inch x 300mm 2.5kgs; Model Number: E6013; Operating Current: DC AC Welding Current: (3/32) 50 – 90A (1/8) 90 – 130A	2,600.00	2,600.00
10	pc	wood screw (d = 3.5mm; L = 1.25 inches)	50.00	500.00
3	kg	common nail (2-inch)	91.00	273.00
1	pc	18mm mild steel shaft	1,800.00	1,800.00
1	pc	Gs Cast Acrylic Sheets.	4,095.00	4,095.00
1	pc	GI Sheet Plain Gauge 16 x 8' (1.613mm thick)	2,418.00	2,418.00
3	set	LM317 AC/DC Adjustable Voltage Regulator Step-down Power Supply Module W/LE(Specification:Item Type: Motor Speed ControllerOperation Current: Under 2ASize: Approx. 32mm * 32 * 14mm / 1.3 * 1.3 * 0.6inWeight: Approx. 13.4g / 0.47oz)	500.00	1,500.00
3	set	Motor Speed Controller, Electric Motor Speed Controller DC Regulator Speed Motor Controller, for Exhaust Fan Motor Car Wiper Motor	200.00	600.00
6	pc	3 Pins Rocker Switch Slim Type 20A Red with LED Light Toggle ON OFF DC/ AC	50.00	300.00
1	set	100 pcs Solder Seal Wire Connectors - Heat Shrink Solder Butt Connectors - Solder Connector Kit - Automotive Marine Insulated	150.00	150.00
1	set	1mm diameter Electrical Wires Model Material Wire Connection Line Fittings/5m (Type:Insulated; Conductor material:Aluminum; Conductor type:Solid; Insulation material:PE)	1,000.00	1,000.00
1	set	2mm diameter Electrical Wires Model Material Wire Connection Line Fittings/5m (Type:Insulated; Conductor material:Aluminum; Conductor type:Solid; Insulation material:PE)	1,000.00	1,000.00
144	pc	3.7v 750mah lithium ion rechargeable battery li-ion battery	425.00	61,200.00
12	pc	3.7v Lithium Ion Battery Charger Portable Travel Charger 110V-240V Input	250.00	3,000.00
12	pc	Lithium ion 3.7V, 750mah 4 Slots 18650 Battery Holder Storage Box (Made of ABS material, lightweight, convenient to carry. This battery box holder with wires, suitable for 4 x 3.7V 18650 battery. You can use this case with your own battery to form power system supply)	150.00	1,800.00
6	set	set of laser transmitter and sensor (Working Voltage: 5V ;Light Source Wavelength: 650 nm(Approx.); PCB 1.52 X 2.22cm; Output high level when receiving laser signal; Output low level when not receiving laser signal with modulator)	400.00	2,400.00
1	roll	1mm nylon filament 100m	200.00	200.00
1	roll	2mm nylon filament 100m	230.00	230.00
1	roll	3mm nylon filament 100m	250.00	250.00

3	pc	Wood Parquet flooring glue 500g	125.00	375.00
1	set	530pcs Heat Shrink Tubing Insulation Shrinkable Tube Assortment Electronic	500.00	500.00
3	set	LCD I2C 1602 Display Module Yellow(LCDDisplay Mode: STN, Positive, Transflective; Display Color: Blue; Driving Method : 1/16 duty, 1/5 bias; Control Method: I2C; Viewing Angle: 6H)	250.00	750.00
<i>Tools and Equipment</i>				
1	unit	Multitester Voltmeter Tester (Ac current:200ua; Ac voltage:2v~500v; Measuring resistance range:200ohm~20mohm; Operating mode:Manual operation; Measuring inductance range:<80ohm beeper; Display type:Digital display; Dc current:200ua~200ma; Dc voltage:200mv~600v; Measuring capacitance range:200ohm; Dimensions:115*70*20mm; Operating temperature:0 - 40 °C;Measuring voltage range:200mv, 2v, 20v, 200v, 600v;Measuring current range:200ua, 2000ua, 20ma, 200ma	1,300.00	1,300.00
1	unit	handheld Digital LCD Photo Tachometer Laser Non-Contact Tachometer Range 2.5-99999RPM Motor Speed Meter with 1pc Reflective Tape	850.00	850.00
1	pc	0-25mm Digital Micrometer 0.001mm Electronic Micrometers Caliper Gauge Meter (Material: Stainless Steel; Color: As picture show; Size(LxW): Approx.; 155x63mm/6.10x2.48inch; Range: 0-25mm; Resolution: 0.001mm; Errors: ±0.003mm; Display: LCD	2,000.00	2,000.00
1	pc	Electric jigsaw (220-V; 600W with complete accessories)	2,500.00	2,500.00
1	pc	Electric hand drill (Continuous rating input: 450W; Capacity; Steel : 10mm (3/8"); Wood : 25mm (1"); No load speed (rpm): 0-3,400; Overall length: 228x64x183mm; Net weight: 1.3kg (2.9lbs); Power supply cord: 2.0m (6.6ft)	3,000.00	3,000.00
1	set	set of carbide steel, wood hole saw/auger bit (15mm/20mm/25mm/30mm/35mm)	600.00	600.00
1	unit	Automatically Feeding Solder Wire Electronic Soldering Iron (Model : 929D-II; Voltage : 220V ~ 240V/AC,50Hz; Maximum power : 130W; Rated power : 18W; Temperature range : 90 ~ 480°C / 194~896°F with lead wire)	1,600.00	1,600.00
1	unit	Industrial Grade Angle Grinder 4" (760 Watts)(Input power: 760W; Voltage: 230V; Frequency: 50Hz; No load speed: 11000r/min; Disc diameter:100mm; Spindle thread:M10 with complete accessories)	1,200.00	1,200.00
6	pcs	4-inch Cutting Disc for Metal	85.00	510.00
1	unit	Portable Inverter Welding Machine 200 Amperes (Power Voltage (V): 220; Rated Input Capacity(KVA): 3.8; Input Voltage Frequency (Hz): 60; No-Load Voltage (V): 65; Output Current Range (A): 10-200; Duty Cycle (%): 60; Efficiency (%): 85;Insulation Class:F;Protection Class: IP21S)w/complete acsries.	5,300.00	5,300.00
1	unit	Wire Stripper Pliers (Stripping steel claw: hardness (hv550-650 / rc52-57); AWG: 10-24 (0.2-6mm^2); Stripping diameter : 1.4 (mm); Weight : 322 (g); Full length: 210 (mm)	1,700.00	1,700.00
TOTAL COST				PhP123,003.00

Component 3: Disruptive Broom Design

Quantity	Unit	Particulars	Unit price (PhP)	Total Amount (PhP)
100	bundles	Tiger grass, clean	85.00	8,500.00
1	box	Blind rivets, 1/8" x 3/4", 1000pcs per box	1,500.00	1,500.00
1	box	Washers, for 1/8" blind rivets, 2000pcs/box	1,500.00	1,500.00
100	pcs	PVC pipe, 3/4" diameter x 10', blue	150.00	15,000.00
200	pcs	Labels, internal purchase from CET SSF	20.00	4,000.00
5	pcs	C Clamp Vise Grip, 14"	1,200	6,000.00
200	pcs	Discarded 1.5liter soda bottles, plastic	3.00	600.00
2	pcs	Heat gun, HG5030, 1600W	2,200.00	4,400.00
1	box	Bolt and nut, 4mm x 35mm, 2000 sets/box	3,000.00	3,000.00
10	pcs	Cutter, big, 3/4" wide blade	150.00	1,500.00
20	packs	Cable zip tie, Nylon white, 3x150mm, 200pcs per pack	300.00	6,000.00
2	sets	3-piece Plier set, Pliers, Cutter, Long-nose	1,000.00	2,000.00
4	pcs	Scratch Awl, 11.5cm, wood handle	150.00	600.00
2	pcs	Revolving leather hole punch riveter plier tool, 2.5mm to 5mm, heavy duty	500.00	1,000.00
1	unit	Bench Vise, Total, 6" swivel base, 11.2kg weight, 1600kg max force, with anvil	5,000.00	5,000.00
1	unit	Portable drill with hammer, 20V, TIDLI20025, 0-400/0-1500 rpm, max torque 45Nm, 2-speed gear, 2 pcs 2.0Ah 20V battery packs, 1 pc 2hr charger, with riveter adapter	7,500.00	7,500.00
2	units	Hand Riveter, heavy duty	500.00	1,000.00
1	unit	3/16" Licota Air Hydraulic Riveter tool, heavy duty, 1045kgf, 16mm stroke, 2.4-4.8mm riveting capacity	5,500.00	5,500.00
Total Cost				P74,600.00

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