



DOST Form 2 (for Basic/Applied Research)
DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL

(1) PROJECT PROFILE Program Title: Local Grant-in-Aid Project Title: Powering a Farmers' Cooperative Postharvest Equipment in Occidental Mindoro with 20kVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator (RHG-DEEPGen) Project Leader/Sex: Leodegario P. Quilit, Jr. / Male Project Duration (number of months): 12 months for project implementation / 24 months for monitoring of outcomes Project Start Date: June 2023 Project End Date: May 2026 Implementing Agency (Name of University-College-Institute, Department/Organization or Company): DOST-MIMAROPA, Occidental Mindoro Provincial S&T Office Address/Telephone/Fax/Email (Barangay, Municipality, District, Province, Region): GF, Blessings 1 Bldg., F.Y. Manalo Avenue, Barangay Pag-asa, San Jose, Occidental Mindoro						
(2) COOPERATING AGENCY/IES (Name/s and Address/es) Occidental Mindoro State College, San Jose, Occidental Mindoro						
(3) SITE(S) OF IMPLEMENTATION						
IMPLEMEN TATION SITES NO.	COUNTRY	REGION	PROVINCE	DISTRICT	MUNICIPALITY	BARANGAY
1.	Philippines	MIMAROPA	Occ. Mdo	Lone	Magsaysay	Poblacion
(4) TYPE OF RESEARCH <input type="checkbox"/> Basic <input checked="" type="checkbox"/> Applied				(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022) <input type="checkbox"/> Agriculture, Aquatic and Natural Resources Commodity: _____ <input type="checkbox"/> Health Priority Topic: _____ <input checked="" type="checkbox"/> Industry, Energy and Emerging Technology Sector: <u>Agriculture</u> <input type="checkbox"/> Disaster Risk Reduction and Climate Change Adaptation <input type="checkbox"/> Basic Research Sector: _____		
Sustainable Development Goal (SDG) Addressed				<u>Affordable and Clean Energy, Zero Hunger</u>		
(6) EXECUTIVE SUMMARY (not to exceed 200 words) Powering farmers' cooperative's postharvest equipment with alternative fuel from farm wastes will result in not only combating the recent fuel crisis but also attaining fuel independency in the long run. When converted into combustible gas through gasification, rice husks can provide heat and power needed in powering postharvest facility. The use of surplus engines commonly found on road sides can utilize producer gas instead of petrol as fuel once reconditioned. Farmers don't need to buy petrol fuel to operate their postharvest equipment but instead use their rice husk wastes for proper disposal which abet in reducing the cost of operation and in providing job opportunities to their members. Moreover, disposal of by-products from the mill can be addressed properly with economic benefits; whereas, the char produced from the gasifier can be utilized as soil amelioration material and can facilitate climate mitigation program of the government through carbon sequestration.						
(7) INTRODUCTION						
(7.1) RATIONALE/SIGNIFICANCE (not to exceed 300 words) With the current shortage in the supply of fossil fuel in the world market, prices of diesel and gasoline continued to escalate. As of March 2022, the price of diesel fuel goes as high as P60 to P70 per liter while gasoline reaches as high as P70 to P80 per liter and still increasing with projection of reaching as high as P100 per liter. The agriculture sector, where fuel energy is undeniably needed resulting from aggressive rice mechanization, is one of the heavily affected sectors with these increase in the prices of fuel. A farmers' cooperative equipped with field equipment and postharvest processing machinery, such as pumps, axial flow rice threshers, corn shellers, grain dryers, single-pass rice mills, and many others, requires alternative sources of fuel to combat the issue on fuel price increases. Mechanization significantly aids farmers in increasing production at relatively shorter time period. In the absence of alternative sources of fuel, however, these farm machines cannot be fully put into use. Hence, mechanization will become naught. PhilRice has been working on alternative fuels to run internal combustion engines that farmers commonly use in their farms. One of the alternative fuels that PhilRice has been working on for a couple of decades now is the conversion of rice husks into combustible gas by partial combustion in fixed-bed and moving-bed reactors,						

producing carbon dioxide (CO), hydrogen (H₂), and methane (CH₄) gases ^[5]. The technology was proven to work well with both spark- and compressed-ignition engines providing power for stationary agricultural machines and electricity for energizing off-grid communities.

(7.2) SCIENTIFIC BASIS/THEORETICAL FRAMEWORK

Spark-ignition engines are basically equipped with spark plugs and can be fueled entirely with the producer gas from the rice husk gasifier; whereas, compressed-ignition engines require a little (10%) of diesel fuel to create ignition of producer gas fuel. The major drawback of using spark-ignition engines, however, is its limited sizes (only 16hp and below) which is only suitable for small farm machines. Diesel engines, on the other hand, are available in a wide range of sizes from 5hp for air-cooled single-cylinder engines to even up to 150hp for water-cooled multi-cylinder engines, which can run single-pass rice mill to larger size such as 10in.-diameter centrifugal or axial flow pumps commonly used for communal irrigation application. Diesel fuel replacement of 70 to 90% was proven to work well with the rice husk gasifier developed at PhilRice employing the dry-scrubbing method coupled with non-retrofitted diesel engine. A non-retrofitted diesel engine is used so farmers can operate it either with producer gas or with petrol as fuel, depending on the availability of alternative fuel and on the preference of the farmers.

(7.3) OBJECTIVES

Generally, the objective of the study is to power farmers' cooperative's postharvest equipment in Occidental Mindoro with 20kVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator (RHG-DEEPGen).

It specifically aims to:

1. Build a pilot commercial model of rice husk gasifier unit with multiple-cylinder diesel engine to drive a 20kVA electric generator and provide electrical power for the selected farmers' cooperative's postharvest equipment;
2. Evaluate the performance of the RHG-DEEPGen in powering postharvest equipment such as recirculating dryer, single-pass rice mill, grain conveyors and/or elevators, as well as office, storage, and street lighting at the farmers' cooperative facility;
3. Conduct monitoring and evaluation of the power generating unit as a whole at the farmers' cooperative; and
4. Assess the technical, socio-economics, and environmental impact of the technology at the farmers' cooperative.

(8) REVIEW OF LITERATURE

Tapping energy from ricehull has been found useful for a wide range of applications like irrigation for agricultural purposes. A gasifier system can use ricehull to produce what is called producer gas as source of alternative fuel for the prime mover to pump irrigation water for crop production. The PhilRice-developed ricehull gasifier engine-pump system has 30 cm diameter reactor that uses an average 8.5 kg/hr fresh ricehull to supply producer gas to a 16 hp gasoline engine. The system with an average power output of 6.57 hp can run continuously for a 2-hour pumping operation with an average 9.37 lps shallow tube well (STW) water discharge using 4" diameter pump (*Juliano, Arnold & Gavino, Romeo & Agulto, Melissa & Taylan, Victorino & Jr, Armando & Sicat, Emmanuel. (2016). Improvement of PhilRice-Designed Ricehull Gasifier Engine-Pump System for Rainfed Lowland Irrigation*).

(9) METHODOLOGY

A pilot commercial model of rice husk gasifier unit coupled to a multiple-cylinder diesel engine (diesel fuel replacement of 70 to 90%) and 20kVA electric generator will be provided to Genaro ARB Multi-Purpose Cooperative (Genaro ARB MPC). The unit will be fabricated and installed by a cooperating fabricator in Occidental Mindoro and its performance will be evaluated using the different postharvest equipment in the farmers' cooperative.

The reactor will be a moving-bed downdraft-type with dry scrubbers and filters to clean and cool the gas before it will be used to fuel an internal combustion engine. The prime mover to be used for the gasifier will be a reconditioned multiple-cylinder diesel engine with diesel fuel replacement between 2 to 3 liters and speed of 1500 rpm. The engine drive of the gasifier will be coupled with a 20kVA AC generator on a direct drive transmission with control panel and accessories.

Genaro ARB MPC will undergo evaluation process generally based on the following: (a) commitment to collaborate with the project; (b) availability of postharvest equipment; (c) willingness to provide counterpart such as space availability, including the slab construction for the engine; and (d) willingness to assign manpower to operate and maintain the power unit. Similarly, the cooperating fabricator will be evaluated based on the size of the fabrication shop, availability of tools and equipment, and skills of the manpower.

Performance evaluation will be done by connecting the input motor drive of the equipment onto the power output generating unit of the gasifier. Analysis will be done for the technical, socio-economics, and environmental contributions of the technology to Genaro ARB Multi-Purpose Cooperative (Genaro ARB MPC).

The project will be generally managed by DOST PSTO-Occidental Mindoro in collaboration with Occidental

Mindoro State College (OMSC) and Engr. Alexis T. Belonio, Rice Husk Gasifier Consultant. A project implementation team will be formed comprising the following:

Activities	PROJECT TEAM MEMBERS				
	Consultant	OMSC	PSTO	Genaro ARB MPC	Fabricator
Preparation of Contract	-		1	-	-
Design and Fabrication Drawing preparation	1		-	-	-
Preparation of Material Listing for the RHG-DEEPGen	1		-	-	-
Preparation of Table of Specification	1		-	-	-
Production and Operating Cost Analyses	1	2	3	5	4
Conduct of Training/Seminar to Technical Staff and Fabricator re: Rice Husk Gasification	1	3	2	-	4
Discussion with Fabricator Prior to the Fabrication of the RHG-DEEPGen	1	3	2	-	4
Monitoring During Fabrication	2	3	1	5	4
Functional Testing of RHG-DEEPGen Components	1	2	3	5	4
Discussion with Farmer Cooperative on the Installation of the RHG-DEEPGen	3	4	2	5	1
Installation of Gasifier On-Site	-		-	-	1
Performance Testing and Evaluation	1	2	3	-	4
Actual Operation and Monitoring	3	4	2	1	-
Improvement of RHG-DEEPGen Components	1	4	3	5	2
Survey Questionnaire with FC and CF	2	1	3	5	4
Analysis of Data Gathered	2	1	3	5	4
Report Writing and Submission	2	1	3	-	-

Notes: Numbers refer to level of responsibility in the project. 1 is the highest and 5 is the least.

4.1 Phases of Activities

The following are the different phases of activities to be carried out:

Phase 1 – Fabrication Drawing Preparation

The fabrication drawing of RHG-DEEPGen will be prepared by the Consultant for use by the Cooperating Fabricator (CF) in constructing the gasifier. Based on design scaling and calculations, the reactor will have a 70cm diameter instead of 30 cm with heat exchanger and gas filters to provide cooled and cleaned gas for the engine power drive. A battery-started reconditioned Mitsubishi 4D32 diesel engine or any brand with 20KVA, 220volt, single/three-phase AC alternator complete with accessories (AVR, control panel, safety control, etc.) will be directly coupled to the engine. Concrete cooling tank will be constructed beside the engine. Though the unit does not require automation, however, only parts with critical functions will be automated. Examples are the engine and generator parts which will require control panel for the operator to easily see the temperature, voltage, ampere, and output of the system. Conveyors and other components to make the operation of the gasifier easy will not be provided to minimize the parasitic load of the gasifier; thereby, maximizing the power available for utilization. Basically, this size of the gasifier can be handled manually by operator(s). Fabrication materials such as mild steel, high carbon steel, and stainless steel will be used as materials for the fabrication of the gasifier. List of materials (Fabrication, Standard, and Consumables), equipment, and tools needed will be prepared in addition to the drawings. Cost estimates to fabricate the unit, which include both the direct and indirect costs plus taxes and profit margin will be prepared prior to meeting with prospective fabricators. Projected operating cost and payback period of the gasifier unit will also be determined in advance for perusal of the project’s viability. The cost to build the gasifier, including its components, will be discussed to finalize the budget that needs to be allocated for the project. This will be referred to the production cost analysis to be prepared by the Team.

Phase 2 – Release of Funds

Once all the documents are submitted and approved, DOST-MIMAROPA, through PSTO-Occidental Mindoro will download/release the approved project funds to Genaro ARB MPC.

Phase 3 – Training of Technical staff

Training of the technical staff including the members of the Team who will be involved in the project will be conducted, particularly on the design, fabrication, installation, operation and maintenance, testing and evaluation, and economics of the gasifier. This activity basically will give freehand information and understanding on how the project is to be undertaken and how it is to be scaled in relation to its future application in other Farmers Cooperative (FCs) in the province.

Phase 4 – Fabrication and Functional Testing

Once the fabrication drawing is completed and discussed with the Team, itemized list of materials and equipment/tools needed will also be identified. The Team will then present the drawing to the selected CF to finally iron out everything before starting the fabrication.

Regular monitoring during the fabrication will be done to ensure that the unit will be built as per specifications provided by the Designer. Materials to be used will be checked to ensure that they strictly conform with what is specified in the drawings and in the Table of Specifications provided. In case of unavailability of the specified materials in the drawing, the Team and the Fabricator will discuss the possibility of possible compromises to be done without or with minimal effect on the performance of the gasifier.

Components of the gasifier unit will undergo functional testing and fine tuning before they will be sent for installation upon approval of the Team. The components that will be subjected to functional testing will include the reactor, the heat exchanger, the gas filter, the engine drive, and the AC generator and their accessories.

Phase 5 – Installation and Preliminary Testing

After ensuring the functionality of the different parts of the RHG-DEEPGen, the unit will be installed at Genaro ARB MPC facility. Prior to the installation, however, the Team will visit FC to ascertain the location and to prepare the necessary constructions to be done. These include shed/wall, floor slab, engine foundation, cooling tank as well as the electrical wiring installation needed.

Phase 6 – Operation and Performance Testing and Evaluation

The performance testing and evaluation of the gasifier and engine unit will be conducted by OMSC together with the Consultant and DOST PSTO-Occidental Mindoro Engineers. Data on the operational performance of the RHG-DEEPGen unit in powering the different postharvest equipment will be gathered. The different postharvest equipment to be tested will include grain cleaner, flatbed dryer, recirculating dryer, single-pass rice mill, handling equipment, as well as office and facility lighting. This different postharvest equipment will be tested to determine the power output that the gasifier can provide. Test runs will be carried out starting from the equipment with less power requirement to the equipment with greater power requirement but not exceeding 20kVA, which is the maximum power output of the RHG-DEEPGen. Test runs of 1 hour or more each run with data gathering at 10-minute interval will be done at the initial stage for every equipment to be tested. During the actual operation of each equipment, continuous monitoring with 30-minute interval data gathering will be done.

Rice husk fuel will be secured to ensure that sustainable quality rice husks is available all the time. During the 1-hour test of each equipment, various parameters of the gasifier-engine unit will be determined. These include the following: (a) start-up time; (b) gas generation time; (c) airflow and gas flow rates at the reactor; (d) gas temperature at the different points in the system such as after the reactor, heat exchanger, gas filters, before the intake manifold of the engine, and flue gases leaving the muffler. The temperature of water used in cooling the engine will also be taken. The amount of rice husk fuel and diesel fuel consumed will also be determined to ascertain the percentage fuel displacement when using the gasifier. The power output of the generator for a particular equipment will be recorded in terms of voltage and current as indicated at the panel. The quality of the product will also be assessed during the evaluation of the gasifier-driven equipment.

From the data gathered, the following parameters will be analyzed: (1) Fuel consumption rate (rice husks and diesel); (2) Specific gasification rate; (3) Percentage diesel replacement; (4) Power input; (5) Power output (Voltage, Ampere, and Hertz); (6) Thermal efficiency of the gasifier; (7) Brake thermal efficiency of the engine; (8) Overall system efficiency; and (9) Others. During the actual testing of the gasifier for each powered equipment, data sheets will be provided to the Technical staff of Genaro ARB MPC to fill-out during operation. Data to be recorded in the data sheet include: (a) machine being driven by the RHG-DEEPGen; (b) operating period; (c) weight of rice husk consumed; and (d) others. DOST PSTO-Occidental Mindoro Engineers will monitor the operation of the gasifier. Aside from those data, char disposal, tar accumulation, dust emission, engine emission, etc. will also be noted.

Phase 6 – Socio-Economic and Environmental Impacts Assessment

The following information will be assessed from the project:

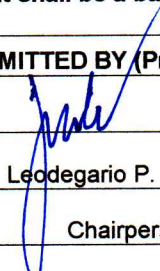
- (1) Economics - Operating cost of the gasifier per hour, product output of gasifier-engine unit per hour, payback period, Benefit-Cost Ratio (BCR), and Return on Investment (ROI) will be analyzed based on the actual data gathered.
- (2) Social Benefits - Information on the social benefits that can be derived from operating the gasifier-engine unit through focus group discussion with the COOP Officers and members will be conducted. This includes information on the savings derived, added income, labor opportunities, etc.
- (3) Environmental Impact - This includes noise pollution, CO and CO₂ emission, disposal of tar, disposal of char, etc.

<p>Instrumentation</p> <p>The following instruments will be used during the testing of the engine-gasifier units:</p> <ol style="list-style-type: none"> 1. Digital Stop Watch – This will be used for recording the time to start and to determine the overall time of operating the engine and the gasifier. 2. Moisture Meter - This will be used to determine the moisture content of the rice husk fuel to be used. 3. Tachometer – This will be used to measure the speed of the engine shaft as well as of the generator shaft. 4. Digital Thermometer/Data Logger – This will be used to measure the temperatures at the different parts of the gasifier and of the engine. 5. Pressure Gauge - This will be used to determine the pressure required in the gasifier and in the engine. 6. Thermo-Anemometer/Data Logger - This will be used to determine the velocity of the gas passing through the gas pipe in order to account for the air or gas flow in the gasifier and those entering the engine intake manifold. 7. Pressure Manometer – This will be used to determine the pressure draft at the different components of the gasifier and at the engine intake manifold. 8. Volumetric Cylinder – This will be used to measure the volume of diesel used per test. 9. AC Clamp Meter or Ampere Meter – This will be used to measure the current output of the generator. 10. Multi-Meter or Volt Meter – This will be used to measure the voltage output of the generator. 11. Hertz Meter – This will be used to measure the output cycle of the generator. 12. Sound Meter – This will be used to determine the sound produced by the engine when operated using diesel-producer gas mixture as fuel. 13. CO meter - This will be used to determine the amount of carbon monoxide emitted surrounding the engine during testing. 14. CO2 meter – This will be used to measure the amount of carbon dioxide emitted surrounding the engine during testing.
<p>(10) TECHNOLOGY ROADMAP (if applicable) (use the attached sheet)</p>
<p>(11) EXPECTED OUTPUTS (6Ps)</p> <p>Publication</p> <p>Out of this project, technical papers will be prepared for paper presentation at Philippine Society of Agricultural and Biosystems Engineers (PSABE) Convention and at other scientific conferences. Research paper will also be written and be submitted for publications in journals, or as book chapter. Technical and operation manuals of the gasifier system will be prepared which can be used as materials for seminars/trainings to be conducted in the future.</p> <p>Patent/Intellectual Property</p> <p>Utility model will be applied for patent for the design and for the operation of the plant.</p> <p>Product</p> <p>Once gained acceptance, more FCs will be confident to adopt the RHG-DEEPGen for their specific use. The design will be scaled up, depending on the power requirement in a particular farmers' cooperative. More fabricators or manufacturers will also be encouraged to engage in the production and commercialization of the technology.</p> <p>People Service</p> <p>More people will benefit from it for a low-cost and readily available power source can be tapped and used right at the farmers' cooperative facility. More skilled workers such as welders, mechanics, technical staffs of farmers' cooperatives, engineering students, researchers and developers, etc. will have the opportunity for an exposure, if not have hands-on experience, in designing and operating such a simple technology that uses biomass wastes as fuel.</p> <p>Place and Partnership</p> <p>Fabrication shops/manufacturers, other research institutions, colleges and universities, sales and distributors, etc. will have the prospect to engage in partnership with DOST-MIMAROPA and Engr. Belonio for the furtherance of the utilization of this technology that would help farmers and the agri-fishery sector, in general.</p> <p>Policy</p> <p>Utilization of biomass as source of feedstock for alternative energy can be given emphasis in conjunction with the Renewable Energy Act, AFMech Law, and Clean Air Act. Government policy on the proper use and disposal of biomass needs to be formulated. Likewise, policy that would require utilization of imported surplus engines and old diesel engines has to be formulated to properly and efficiently utilize these discarded products rather than re-melting metals to dispose them.</p>
<p>(12) POTENTIAL OUTCOMES</p> <p>This project will lead to the:</p> <ol style="list-style-type: none"> a. utilization of agricultural wastes like rice husks, corn cobs, sugar bagasse, etc. as alternative source of power; b. utilization of the many available surplus diesel engines mostly found on road sides to be used for

providing power to stationary agricultural machines for farming and processing activities; c. reduction in the cost of power farming through the use of agri-wastes as fuel; and d. promotion of the advocacy on aggressive utilization of biomass energy in agriculture for reducing farming and processing expenses, for proper disposal of wastes, and for climate change mitigation by reduction of CO2 emission through carbon sequestration.				
(13) POTENTIAL IMPACTS (2Is) <i>Social Impact-</i> The technology can provide farmers' cooperatives access to engage in a more profitable business that can provide additional income for their members, and to have access to communication infrastructure and office equipment once a low-cost electricity is made available. <i>Economic Impact-</i> Cost reduction in their farming (field and postharvest processing) operation. Added revenue to both local and national governments can be expected. Minimize the use and transport of imported fuel that adds to the cost of operating farm machinery.				
(14) TARGET BENEFICIARIES Name: Genaro ARB Multi-Purpose Cooperative Address: Sitio Fernandez, Poblacion, Magsaysay, Occidental Mindoro Date Organized: January 12, 1982; registered as Genaro Samahang Nayon CDA Registration Number: 9520-04001662 Date of Registration: January 21, 1991 Current Membership: 289 Business Activities: Relending, Palay Trading, Consumer Stores, Bank-Like Savings Deposit, Agri-inputs Dealer, Fuel Refilling Station, Rice Milling, Farm Tractor, Trucking, Drying, Harvesting/Threshing Successfully-implemented projects: DA (Ford Combine Rice Harvester, Dryer, R180 Genset, Sundrying Pavement, Jander Tractor, Yanmar Tractor, DC70 Plus Combine Rice Harvester, Isuzu Wing Wan, and Rice Transplanter); DAR (JICA Warehouse)				
(15) SUSTAINABILITY PLAN (if applicable) By providing FC with technical guidance even after the project until they are well capable of operating, maintaining, and troubleshooting the operation of the gasifier-engine system. Providing DOST PSTO-Occidental Mindoro Engineers, OMSC researchers, and technical personnel of Genaro ARB MPC and CF with the sufficient knowledge on the operation of the gasifier-engine system before and after the project implementation will ensure sustainable operation of the project and potential adoption to other FCs.				
(16) GENDER AND DEVELOPMENT (GAD) SCORE (refer to the attached GAD checklist)				
(17) LIMITATIONS OF THE PROJECT The project is limited to the fabrication of a pilot commercial model of 20kVA rice husk gasifier unit with multiple-cylinder diesel engine to drive an electric generator and provide electrical power for the GENARO ARB MPC's recirculating dryer, single-pass rice mill, grain conveyors and/or elevators, as well as office, storage, and street lighting at the cooperative facility. This also include performance evaluation for the said equipment.				
(18) LIST OF RISKS AND ASSUMPTIONS RISK MANAGEMENT PLAN (List possible risks and assumptions in attaining target outputs or objectives.) Please see DOST Form 5C Risks and Assumptions				
(19) LITERATURE CITED <i>Improvement of PhilRice-Designed Ricehull Gasifier Engine-Pump System for Rainfed Lowland Irrigation. Juliano, Arnold & Gavino, Romeo & Agulto, Melissa & Taylan, Victorino & Jr, Armando & Sicat, Emmanuel. (2016)</i>				
(20) PERSONNEL REQUIREMENT				
Position	Percent Time Devoted to the Project	Responsibilities		
Fabricator/Supplier	100 %	Fabrication of the 20-KVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator		
Consultant	75%	Technical aspects of the technology		
Researcher	75%	Data gathering and analysis		
(21) BUDGET BY IMPLEMENTING AGENCY				
IMPLEMENTING AGENCY	PS	MOOE	EO	Total
Year 1		241,550.00	2,200,000.00	2,441,550.00
Year 2				
Year n				
TOTAL				

(22) OTHER ONGOING PROJECTS BEING HANDLED BY THE PROJECT LEADER: _____ (number)		
Title of the Project	Funding Agency	Involvement in the Project
(23) OTHER SUPPORTING DOCUMENTS (Please refer to page 2 for the additional necessary documents.)		

I hereby certify the truth of the foregoing and have no pending financial and/or technical obligations from the DOST and its attached Agencies. I further certify that the programs/projects being handled is within the prescribed number as stipulated in the DOST-GIA Guidelines. Any willful omission/false statement shall be a basis of disapproval and cancellation of the project.

	SUBMITTED BY (Project Leader)	ENDORSED BY (Head of the Agency)
Signature		
Printed Name	Leodegario P. Quilit, Jr.	
Designation/Title	Chairperson	
Date		

Note: See guidelines/definitions at the back.

DOST Form 4

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Project Line-Item Budget
CY 2023

Program Title : Local Grant-in-Aid
 Project Title : Powering a Farmers' Cooperative Postharvest Equipment in Occidental Mindoro with 20-KVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator (RHG-DEEPGen)
 Implementing Agency : Genaro ARB Multi-Purpose Cooperative
 Total Duration : 1 year for project implementation / 2 years for monitoring of outcomes
 Current Duration :
 Cooperating Agency : Occidental Mindoro State College
 Program Leader : DOST-MIMAROPA, Occidental Mindoro PSTO
 Project Leader : Leodegario P. Quilit, Jr.
 Monitoring Agency : DOST-MIMAROPA, Occidental Mindoro PSTO

				Counterpart Funding	
		DOST-MIMAROPA		OMSC	Genaro ARB MPC
I. Personal Services	P		P P		
<u>Direct Cost</u>					
Salaries (2 Researchers)		-		394,704.00	-
Sub-total for PS	P	-	P	394,704.00	-
I. Maintenance and Other Operating Expenses					
<u>Direct Cost</u>					
Traveling Expenses - local		75,000.00		-	-
Training Expenses					
Traveling Expenses - local		30,000.00		-	-
Supplies and Materials Expenses		5,000.00		-	-
Fuel, Oil and Lubricants Expenses		9,000.00		-	-
Other Professional Services		12,600.00		-	-
Printing and Publication Expenses		1,000.00		-	-
Representation expenses		10,000.00		-	-
Supplies and Materials					
Office supplies		18,000.00		-	-
Fuel, Oil and Lubricants Expenses		6,000.00		-	-
Communication Expenses					
Telephone Expenses - Mobile		5,850.00		-	-
Internet Subscription Expenses		8,700.00		-	-
Taxes, Duties and Licenses		-		-	-
Insurance Expenses		15,400.00		-	-
Representation Expenses		-		-	5,000.00
Professional Expenses (Expert/Consultant)		45,000.00		-	50,000.00
Operating and Maintenance Expenses		-		-	-
Sub-Total for MOOE	P	241,550.00	P	-	55,000.00
II. Equipment Outlay					
Machinery					
20kVA Rice Husk Gasifier-Diesel Engine	P	2,200,000.00	P	-	-
ElectricPower-Generating System	P	2,200,000.00	P	-	-
Sub-Total for EO	P	2,200,000.00	P	-	-
III. Fixed Assets					
Land/Building	P	-	P	-	300,000.00
Sub-Total for Fixed Asset	P	-	P	-	300,000.00
GRAND TOTAL	P	2,441,550.00	P	394,704.00	355,000.00

(To be filled-up by DOST)

* Chargeable against the CY 2023 DOST-GIA P **2,441,550.00**

Prepared by:

LEODEGARIO P. QUILIT, JR.
 Genaro ARB MPC Chariperson

WENY N. SABADO
 Genaro ARB MPC Treasurer

Approved by:

DR. MA. JOSEFINA P. ABILAY
 Regional Director

Certified Funds Available:

XAVIER MAC DANIEL A. ORTIZ
 DOST-MIMAROPA Accountant

GAD Checklists 2: For the Project Identification and Design Stages

Note: Put 'X' mark on appropriate box

Element and items/question (col.1)	Done? (col.2)			Score for an item/ element (col.3)	Comments/ gender issues identified (col.4)
	No (2a)	Partly (2b)	Yes (2c)		
1.0 Involvement of women and men (max score: 2; for each item, 1)				2	
1.1 Participation of women and men in beneficiary groups in the identification of the problem (possible scores: 0, 0.5, 1.0)			X	1	
1.2 Participation of women and men in beneficiary groups in project design (possible scores: 0, 0.5, 1.0)			X	1	
2.0 Collection of sex-disaggregated data and gender-related information (possible scores: 0, 1.0, 2.0)			X	2	
3.0 Conduct of gender analysis and identification of gender issues (max score: 2; for each item, 1)				1	
3.1 Analysis of gender gaps and inequalities related to gender roles, perspectives and needs, or access to and control of resources (possible scores: 0, 0.5, 1.0)		X		0.5	
3.2 Analysis of constraints and opportunities related to women's and men's participation in the project (possible scores: 0, 0.5, 1.0)		X		0.5	
4.0 Gender equality goals, outcomes, and outputs (possible scores: 0, 1.0, 2.0) Does the project have clearly stated gender equality goals, objectives, outcomes or outputs?	X			0	
5.0 Matching of strategies with gender issues (possible scores: 0, 1.0, 2.0) Do the strategies and activities match the gender issues and gender equality goals identified?		X		1	
6.0 Gender analysis of the likely impacts of the project (max score: 2, for each item, 0.67)				0.99	
6.1 Are women and girl children among the direct or indirect beneficiaries? (possible scores: 0, 0.33, 0.67)		X		0.33	
6.2 Has the project considered its long-term impact on women's socioeconomic status and Empowerment? (possible scores: 0, 0.33, 0.67)		X		0.33	
6.3 Has the project included strategies for avoiding or minimizing negative impacts on women's status and welfare? (possible scores: 0, 0.33, 0.66)		X		0.33	
7.0 Monitoring targets and indicators (possible scores: 0, 1.0, 2.0) Does the project include gender equality targets and indicators to measure gender equality outputs and outcomes?	X			0	
8.0 Sex-disaggregated database requirements (possible scores: 0, 1.0, 2.0) Does the project M&E system require the collection of sex-disaggregated data?			X	2	
9.0 Resources (max score: 2; for each item, 1)				0.5	
9.1 Is the budget allotted by the project sufficient for gender equality promotion or integration? OR, will the project tap counterpart funds from LGUs/ partners for its GAD efforts? (possible scores: 0, 0.5, 1.0)	X			0	
9.2 Does the project have the expertise to promote gender equality and women's empowerment?					

OR, is the project committed to investing project staff time in building capacities within the project to integrate GAD or promote gender equality? (possible scores: 0, 0.5, 1.0)		X		0.5	
10.0 Relationship with the agency's GAD efforts (max score: 2; for each item, 0.67)				1.33	
10.1 Will the project build on or strengthen the agency/ PCW/ government's commitment to the empowerment of women? (possible scores: 0, 0.33, 0.67) IF THE AGENCY HAS NO GAD PLAN: Will the project help in formulating the implementing agency's GAD plan?			X	0.67	
10.2 Will the project build on the initiatives or actions of other organization in the area? (possible scores: 0, 0.33, 0.67)		X		0.33	
10.3 Does the project have an exit plan that will ensure the sustainability of GAD efforts and benefits? (possible scores: 0, 0.33, 0.67)		X		0.33	
TOTAL GAD SCORE FOR THE PROJECT IDENTIFICATION AND DESIGN STAGES				10.82	

Interpretation of the GAD score

0 - 3.9 GAD is invisible in the project (proposal is returned).

4.0 - 7.9 Proposed project has promising GAD prospects (proposal earns a "conditional pass," pending identification of gender issues and strategies and activities to address these and inclusion of the collection of sex-disaggregated data in the monitoring and evaluation plan).

8.0 - 14.9 Proposed project is gender-sensitive (proposal passes the GAD test)

15.0 - 20.0 Proposed project is gender-responsive (proponent is commended).

DOST Form B
PROJECT WORKPLAN

(1) Program Title:

(2) Project Title: POWERING A FARMERS' COOPERATIVE POSTHARVEST EQUIPMENT IN OCCIDENTAL MINDORO WITH 20-KVA RH GASIFIER-DIESEL ENGINE-ELECTRIC POWER GENERATOR

(3) Total Duration (in months): 36 months

(4) Planned Start Date: June 01, 2023

(5) Planned End Date: May 01, 2026

[illegible]

(9) EXPECTED OUTPUTS (6Ps)	(10) DETAILS (quantify, if possible)	Y1			
		Q1	Q2	Q3	Q4
Publications	Technical paper for PSABE presentation Research paper for submission to journal Technical manual on design, fabrication, operation and maintenance ,				1 paper for PSABE, 1 paper for journal, 1 technical manual
Patents/IP	Utility model patent submission				Patent description submitted to IPO-Phil
Products	Working unit of 20kVA Rice Husk Gasifier installed and use at FC				1 complete unit installed and ready for testing
People Services	Training of engineers and technical staff of Team, Cooperating Fabricator, Demo of the gasifier system operating at the Farmer's cooperative Seminar lecture to interested faculty and students from universities and research institution, Government agencies, etc				At least 10 Engineers and technical staffs trained
Places and Partnerships	Farmers cooperatives in Occidental Mindoro Cooperating manufacturers in Occidental Mindoro State colleges and universities Private business organizations				FC and CF visited the project including students from SCUs and interested organizations
Policy	Advocacy on the utilization of biomass as fuel for decentralized operation Advocacy on the utilization of surplus and old engines for renewable energy application. Advocacy on the production of char from gasification for climate change mitigation				To be done by DOST, FC, and CF in the province only



DOST Form 5
C – RISKS AND ASSUMPTIONS

(1) Program Title: Local Grant-in-Aid

(2) Project Title: Corn-based Feed Formulation and Production for Hog and Poultry in Occidental Mindoro

(3) Project Duration (number of months): 36 months

(4) Project Start Date: 2023

(5) Project End Date: 2026

OBJECTIVES	(11) RISKS AND ASSUMPTIONS	(12) ACTION PLAN (use separate sheet if necessary)
Build a pilot commercial model of 20kVA rice husk gasifier unit of PhilRice with multiple-cylinder diesel engine to drive an electric generator and provide electrical power for the selected farmers' cooperative's postharvest equipment;	Delayed fabrication	Strict implementation of scheduled activities. Continuous coordination with the fabricator.
Evaluate the performance of the gasifier-engine-power generating unit in powering postharvest equipment such as recirculating dryer, single-pass rice mill, grain conveyors and/or elevators, as well as office, storage, and street lighting at the farmers' cooperative facility;	Delayed conduct of performance evaluation due to delayed fabrication	Strict implementation of scheduled activities. Continuous coordination with the fabricator.