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 20-KVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator

Project Leader/Sex: Dr. Manuel Jose C. Regalado/Male

Project Duration (number of months): 36 months

Project Start Date: October 2023

Project End Date: October 2026

Implementing Agency (Name of University-College-Institute, Department/Organization or Company):

Genaro ARB Multi-Purpose Cooperative

Address/Telephone/Fax/Email (Barangay, Municipality, District, Province, Region):

Sitio Fernandez, Poblacion, Magsaysay, Occidental Mindoro

(2) COOPERATING AGENCY/IES (Name/s and Address/es)

Philippine Rice Research Institute (PhilRice)

Barangay Maligaya, Science City of Muñoz, 3119 Nueva Ecija

(3) SITE(S) OF IMPLEMENTATION

IMPLEMENTATION SITES NO.	COUNTRY	REGION	PROVINCE	DISTRICT	MUNICIPALITY	BARANGAY
1.		MIMAROPA	Occ. Mdo	Lone	Magsaysay	Poblacion

(4) TYPE OF RESEARCH

_____. Basic

__✓__. Applied

(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022)

_____ Agriculture, Aquatic and Natural Resources
Commodity: _____

_____ Health
Priority Topic: _____

__✓__. Industry, Energy and Emerging Technology
Sector: Agriculture

_____ Disaster Risk Reduction and Climate Change Adaptation

_____ Basic Research
Sector: _____

Sustainable Development Goal (SDG) Addressed

Affordable and Clean Energy, Zero Hunger

(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 PhiliRice 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.

It specifically aims to:

1. 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;
2. 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;
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 20-kVA rice husk gasifier unit coupled to a multiple-cylinder diesel engine (diesel fuel replacement of 70 to 90%) and electric generator will be provided to a selected farmers' cooperative with postharvest equipment. 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.

The farmers' cooperative that will be selected for the project 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 the Farmer's Cooperative.

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

Phase 1 – Selection of Farmers' Cooperative and Cooperating Fabricator
The teams from PhilRice and DOST Mindoro will meet to formulate and identify the Farmer's Cooperative (FC) and Cooperating Fabricator (CF) for the gasifier power generating unit project. Factors to consider in the selection of FC are: (a) 100% commitment to cooperate; (b) willing to adopt the technology; and (c) willing to use its postharvest equipment and part of their facility for the project. In the case of CF, assessment will be done in terms of the capability of the fabricator to build and install the said unit in terms of the availability of tools and equipment as well as the skills of the manpower. After identifying the FC and the CF to be involved in the project, a memorandum of agreement (MOA) stipulating the responsibilities of each contracting party will be signed for legal purposes.

Phase 2 – Fabrication Drawing Preparation and Training of Technical Staff
The fabrication drawing of a 20kVA rice husk gasifier power generating unit will be prepared for use by CF in constructing the gasifier. The unit will be an enlarged scale of the rice husk gasifier with dry-scrubbing gas conditioning device developed at PhilRice Rice Engineering Mechanization Division (REMD). 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.
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 will be done for one whole day at PhilRice either on-site or on-line, depending on the situation during the project implementation. 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 FCs in the province.

Phase 3 – 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. 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.
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 4 – Installation and Preliminary Testing
After ensuring the functionality of the different parts of the gasifier, the unit will be installed at the FC 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 5 – Operation and Performance Testing and Evaluation
The performance testing and evaluation of the gasifier and engine unit will be conducted by PhilRice technical staff together with DOST Mindoro Engineers. Data on the operational performance of the gasifier 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 gasifier. 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 from FC rice mills 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 FC to fill out during operation. Data to be recorded in the data sheet include: (a) machine being driven by the gasifier; (b) operating period; (c) weight of rice husk consumed; and (d) others. DOST PSTO-Occidental Mindoro Engineers will monitor the operation of the gasifier as per guidance of PhilRice Engineers. 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.

Instrumentation

The following instruments will be used during the testing of the engine-gasifier units:

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.

(10) TECHNOLOGY ROADMAP (if applicable) (use the attached sheet)

(11) EXPECTED OUTPUTS (6Ps)

Publication

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.

Patent/Intellectual Property

Utility model will be applied for patent for the design and for the operation of the plant.

Product

Once gained acceptance, more FCs will be confident to adopt the Rice Husk Gasifier-Diesel Engine-Electric Power Generator 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.

People Service

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.

Place and Partnership

Fabrication shops/manufacturers, other research institutions, colleges and universities, sales and distributors, etc. will have the prospect to engage in partnership with DOST and PhilRice for the furtherance of the utilization of this technology that would help farmers and the agri-fishery sector, in general.

Policy

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.

(12) POTENTIAL OUTCOMES

This project will lead to the:

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 CO_2 emission through carbon sequestration.

(13) POTENTIAL IMPACTS (2Is)

Social Impact- 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.

Economic Impact- 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 Engineers and technical personnel of FC and CF with the sufficient knowledge on the operation of the gasifier-engine system before and after the project implementation.

(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 of PhilRice 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

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)

(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

(21) BUDGET BY IMPLEMENTING AGENCY

DOST-MIMAROPA	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	**MANUEL JOSE C. REGALADO**	
Designation/Title	Chief Science Research Specialist	
Date		

Note: See guidelines/definitions at the back.

RS INDUSTRIAL MACHINERY TRADING

Barangay Magbay, San Jose, Occidental Mindoro

Mobile Phone No.: *0949-884-2346*

Date: January 09, 2023

To: **GLETSER C. MALIBIRAN**
SRS II
DOST-Occidental Mindoro
San Jose, Occidental Mindoro

Re: **Product Price Proposal**

Dear **Sir:**

We are pleased to submit herewith our proposal for your consideration and evaluation:

PARTICULARS	QTY	UNIT	TOTAL COST (PHP)
Fabrication, Delivery, and Installation of 20-KVA Rice Husk Gasifier-Diesel Engine-Electric Power Generator	**1**	**lot**	**2,200,000.00**

TERMS OF PAYMENT:

60% DOWNPAYMENT	*1,320,000.00*
20% UPON FINISHING OF FABRICATION	*440,000.00*
20% UPON COMMISSIONING	*440,000.00*
TOTAL	***2,200,000.00***

We trust that you will find the above offer acceptable and we look forward to receive your valued order soon. Should you have any questions regading this offer, please feel free to communicate with us.

Very truly yours,

ALLAN V. SAMSON
Owner/Fabricator/Technician

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
Implementing Agency	:	Genaro ARB Multi-Purpose Cooperative
Total Duration	:	3 years
Current Duration	:	
Cooperating Agency	:	Philippine Rice Research Institute (PhilRice)
Program Leader	:	DOST-MIMAROPA, Occidental Mindoro PSTO
Project Leader	:	Dr. Manuel Jose C. Regalado/Male
Monitoring Agency	:	DOST-MIMAROPA, Occidental Mindoro PSTO

		DOST-MIMAROPA	Counterpart Funding	
			Genaro ARB MPC	Cooperating Agency
II. Maintenance and Other Operating Expenses				
Direct Cost				
Traveling Expenses - local		120,000.00		
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		0.00		
Insurance Expenses		15,400.00		
Sub-Total for MOOE	**P**	**241,550.00**	**P -**	**P -**
II. Equipment Outlay				
20kVA Rice Husk Gasifier-Engine Power-Generating System	P	2,200,000.00	P	P
Indirect Cost				
Sub-Total for EO	**P**	**2,200,000.00**	**P**	**P -**
III. Fixed Assets				
Land and Building	P		P 1,000,000.00	P -
Sub-Total for Fixed Assets	**P**	**-**	**P 1,000,000.00**	**P -**
GRAND TOTAL	**P**	**2,441,550.00**	**P 1,000,000.00**	**P -**

Prepared by:

LEODEGARIO P. QUILT JR.
Chairperson

Approved by:

DR. MA. JOSEFINA P.ABILAY
Regional Direcor

Certified Funds Available:

WENY N. SABADO
Treasurer

XAVIER MAC DANIEL A. ORTIZ
DOST-MIMAROPA Accountant

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:** October 2023 **(5) Planned End Date:** October 2026

(6) OBJECTIVES	(7) TARGET ACTIVITIES	(8) TARGET ACCOMPLISHMENTS (month)	Y1												Y2	Y3
			Q1			Q2			Q3			Q4				
(1) Select a farmers' cooperative with postharvest equipment and a cooperating fabricator to adopt and to build the gasifier, respectively;	Formulation and selection of Farmers' Cooperative and Cooperating Fabricator	2														
	Preparation of production cost of the gasifier and power generating unit	1														
	Preparation of operating cost analysis of gasifier and power generating unit	1														
	Preparation and signing of MOA	1														
	Construction of shed, floor slabs, and engine foundation	1														
(2) Build a pilot commercial model of 20kVA rice husk gasifier unit of PhilRice with multiple-cylinder diesel engine drive to provide electrical power for the selected farmers' cooperative's postharvest equipment;	Preparation of fabrication drawings of gasifier and power generating unit	1														
	Fabrication and Monitoring	3														
	Training on the design, fabrication, etc.	2														
	Functional testing	2														
	Installation of the gasifier	1														
(3) Evaluate the performance of the gasifier unit in powering postharvest equipment such as grain cleaner, flatbed dryer, recirculating dryer, single-pass rice mill, grain conveyors and/or elevators, as well as office, storage, and street lighting at the farmers' cooperative facility;	Preparation for testing and evaluation such as data sheets, fuel and postharvest equipment to be tested.	1														
	Setting up instrumentation facility like thermocouple wire sensors, pressure taps, etc.	1														
	Conduct series of 1 hour tests for each postharvest equipment.	1														
(4) Conduct monitoring and evaluation of the power generating unit as a whole at the farmers' cooperative; and	Preparation of test data sheets and orientation for the data gathering activities	1														
	Data gathering (every 1 hour interval) both for the gasifiier and attached equipment	2														
	Analysis of performance parameters	26														
(5) Assess the technical, socio-economics, and environmental impact of the technology at the farmers' cooperative.	Analysis of data gathered for technical	26														
	Survey and questionnaire for socio-economics)	26														
	Operating cost analysis (Based on the actual data gathered)	26														
	Environmental assessment (disposal activities, estimated carbon sequestration, etc)	26														

(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 to PhilRice-IPO Officel				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 univeristies 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 visit4ed 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