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# CORN GRITS PROCESSING ENTERPRISE SHOWCASING PHILMECH CORN MILL TECHNOLOGIES

Michael A. Gragasin, Earl Rafael P. Labitad and Genaro M. Tolentino

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Michael A. Gragasin, Earl Rafael P. Labitad and Genaro M. Tolentino



Department of Agriculture PHILIPPINE CENTER FOR POSTHARVEST DEVELOPMENT AND MECHANIZATION CLSU Compound, Science City of Muñoz, Nueva Ecija, 2022

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#### ABSTRACT

A model corn grits processing enterprise (CGPE) was successfully developed for the sustainable promotion and commercialization of PHilMech developed corn mill technologies to enable the corn farmers to engage in value adding activities and increase their income. This involved the organization and training of management team, preparation of business plan and operating system/ procedures, market assistance, among others. This development strategy have made the CGPE start-up business to successfully take-off during its initial stage of operation and generates positive income. Financial analysis showed that the internal rate of return of the CGPE is estimated at 18.52% with Net Present Value of Php 475,896 even operating only at 40 hours and 80 hours during its first and second year in the business, respectively. This model CGPE will eventually serve as learning site of PHilMech and the government in general using the three business operating manuals developed in this project. These modules are vital for the sustainable promotion and commercialization of PHilMech corn mill and precleaner technologies, consistent to the 'research for development' program of the government, involving the participation of farmers to revitalize the economy, and the agricultural sector even during COVID pandemic.

#### INTRODUCTION

#### Rationale

During the last decades, the Philippine government has aggressively distributed corn processing facilities such as mechanical dryers and corn mills to enable the farmers/farmers' group to engage in value adding activities and increase their income (DA-Corn Program, 2018).

One of the technologies being distributed by DA is the PHilMech Compact Corn Mill. This corn mill machine has an input capacity of 300-350 kg/h, product or milling recovery of 66-71 % and degerminator efficiency of 82-88 % (Gragasin, et. al., 2017, Gragasin, et. al., 2015). The corn mill features a hexagonal dented screen huller for its degerminator mechanism, rotary T-shape blades for its grinding mechanism, and a three-layer rotating cylindrical screen for its grading mechanism. The new model (Figure 1) is equipped with corn cleaner which consists of winnower and de-stoner to clean corn kernels before the milling process, and two elevators for ease of operation during milling. To date, the PHilMech compact corn mill has total sales 400 units nationwide through the PHilMech licensed local manufacturers. Total of six qualified local manufacturers were granted license to manufacture and sell these technologies.



Figure 1. Manufacturing drawing of the PHilMech Compact Corn Mill with Pre-cleaner

The report of the Bureau of Agricultural Fisheries Engineering (BAFE) of the Department of Agriculture (DA), however, revealed that majority of the postharvest facilities distributed by DA had very low rate of utilization (DA-BAFE, 2016). In most cases, the concerned agencies just delivered the machines to the recipients without any provision of proper training. More so, the program implementers do not provide any support mechanism on how to properly use this machine and how this machine becomes useful and beneficial to them.

To address this low level of utilization of agricultural machinery being distributed by the government to the farmers, PHilMech proposes to provide not only the machine but a whole package of technology and system for the recipients. The machine should be operated as a business enterprise to recoup even just its operating cost. The package of technology shall include, among others, the following: (1) Hand's on training on the operation and maintenance of the machine including the provision of operator's manual as ready reference to the operator; (2) Business plan to make use of the machine as a business enterprise; (3) Business operational system to run the business using the machine; and, (4) Coaching and mentoring during the initial operation of the business.

It is envisaged that this research for development will innovate the way the government provides assistance to farmers particularly on the provision of modern facilities and machinery. As Secretary William Dar emphasized in one of his speech in 2021, "Quality research begets quality teaching and innovation, and quality

teaching and innovation result to quality human capital. Quality human capital attracts investments and eradicates poverty".

For the country's economy to fully recover during and after the pandemic, new viable and sustainable technology-based enterprises must be established in the countryside.

Entrepreneurship is a driving force of bringing innovations to the market place and establishing a community of high growth firm (APO, 2005) wherein the function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention, or more generally, an untried technological possibility of producing a new commodity or producing an old one in a new way or process.

## OBJECTIVES

## General Objective:

To develop a model corn grits processing enterprise (CGPE) that serves as a pathway in demonstrating and commercializing the PHilMech developed compact corn mill with pre-cleaner technologies.

# Specific Objectives:

- 1. Set-up the corn grits processing enterprise in the area;
- 2. Develop a business plan for the CGPE;
- 3. Develop business operating system/protocol/procedures particularly on procurement, production of corn grits, quality assurance, marketing, management and accounting systems of the CGPE; and,
- 4. Determine the socio-economic factors that facilitate the successful and sustainable operations of the CGPE.

#### METHODOLOGY

#### **Conceptual Framework**

The conceptual framework of this development project followed the inputprocess-output-outcome approach. The input for the establishment of model corn grits processing enterprise are the necessary support system to set-up and operate the CGPE such as the provision of corn mill with pre-cleaner, a business plan, organization and training of the management team that will be responsible in the day-to-day operation of the enterprise; assist them until "graduation" in such manner that they are financially stable and have the capability to "survive" in the outside competitive environment (process). This model enterprise as the major final output of this development project shall serve as demonstration center/ learning site (outcome) for other individual or group of farmers interested to start a corn grits processing business using the PHilMech-developed corn mill and precleaner technologies.



# **Materials and Methods**

# Identification and Selection of Project Cooperators

The target or prospect project-cooperators were selected from among the active farmers' cooperatives, including those assisted already by PHilMech, and from farmers' group who are currently engaged in primary corn processing.

The screening process was done through preliminary interviews with prospect individual entity or through the leaders of the associations. The information gathered were validated in consultation with the concerned DA-Regional Field Offices (RFOs), Provincial and Municipal Agricultural Offices, and other key informants who can provide information on the prospect-cooperators' profile of business operations.

After the screening process, two project cooperators were selected. A Memorandum of Agreement (MOA) was entered into between PHilMech and the selected project cooperators to define the specific roles and areas of responsibilities of each party. Among the commitments of the project cooperators in the project were as follows: (1) Provide working space, working capital, and the necessary shed for the corn mill system; (2) Allow project staff to observe, document, gather samples and other related data, and assess the co-operator's business operation as required by the project; (3) Willingly to work with PHilMech in developing the CGPE as a model enterprise for the financial viability and sustainability of the CGPE; (4) Be responsible in operating and ensuring appropriate operation and utilization of the PHilMech corn mill system to ensure its compliance with environmental safety regulations; (5) Immediately report to project staff any problem encountered regarding the operation of the PHilMech corn mill with pre-cleaner technologies; (6) Not sell the PHilMech corn mill with pre-cleaner technologies or engage in its fabrication; and, (7) Free PHilMech from any liability for injury or loss that may arise from the use/operation of the said technologies.

# **Development of Business Plan**

As designed, the CGPE shall engage in buying corn grains, milling/processing using the PHilMech developed corn mill technologies, packaging, labeling and selling corn grits in the market. As such, a business plan was prepared to provide better understanding on the organizational structure, competitive landscape, and the capital requirements of starting the business. Corollary to this, a Value Proposition Canvas was prepared to identify, qualify and demonstrate the benefits that the consumers can get when buying the corn grits product of the CGPE. Along with the Value Proposition Canvass is the preparation of Business Model Canvas. The canvass is a one-page summary describing the high-level strategic details needed to successfully market the corn grits product.

# Setting-up of CGPE

As part of the commitment of the project to the project cooperators, PHilMech provided the needed corn mill facilities for the establishment of CGPE. The project cooperators were trained regarding the principle of milling, as well as the operation and maintenance of the corn mill. Lecture and hands-on training were conducted.

A "user's manual" of the corn mill was developed and provided to the project cooperators to appropriately guide them on the proper operation and maintenance of the corn mill system. It is understood that the necessary operating capital, including the business permits (i.e., mayor's permit, DTI and BIR registration, among others) were properly secured by the project cooperators.

# Technical Assistance During "Existence" and "Survival" Stages of the CGPE Business

According to Harvard Business Review, the five stages of small business growth are as follows: Stage 1 - Existence; Stage 2 - Survival; Stage 3 - Success; Stage 4 - Take-Off; and, Stage 5

**Resource Maturity.** The project was directly involved during the existence and survival stages of the business only. This is the stage when the CGPE is ready to generate enough cash flow to stay in the business and to finance business growth. As such, the project accomplished all the project activities (from selection of project co-operators, setting up of business, initial operation) within two years, the duration of the project.

**Churchill and Lewis (1983) describes the 'Existence Stage'**. When the business is simple one – the owner does everything and directly supervises subordinates, who should be of at least average competence. Among the key indicators-issues under this stage are as follows: "Can the enterprise get enough customers, deliver products, and provide services well enough to become a viable business? Can business expand from that one key customer or pilot production process to a much broader sales base? Do the business have enough money to cover the considerable cash demands of this start-up phase?"

In reaching the '*Survival Stage*', the business entity has enough customers and satisfies them sufficiently with its products or services to keep them operational (Churchill and Lewis, 1983). The key problem, thus, shifts from mere existence to the relationship between revenues and expenses. The main issues are as follows: "In the short run, can the business generate enough cash to break even and to cover the repair or replacement of the capital assets as they wear out? Can the business at a minimum, generate enough cash flow to stay in business and to finance growth to a size that is sufficiently large, given the industry and market niche, to earn an economic return on assets and labor?"

# Analysis of Business Operation

The project conducted business analysis on the actual operation of the CGPEs. As emphasized by Katleen Barret, CEO of International Institute of Business Analysis (IIBA), companies of all sizes need to imbe business analysis into their organizational infrastructure and mind set. Understand why they exist – their vision - and what it means to the products and services they offer. Who are their customers? What is their value discipline? How do they deliver those products and services to the market? What is their competition doing? How is the market evolving? What needs to change to ensure ongoing success? These are the fundamentals elements in analyzing the operation of the CGPE to succeed.

# Drafting of Business Operational Manual

The best business operation practices that were established including the setbacks during the course of this project were properly documented. These information were vital in crafting the CGPE's business operational manual. It is noteworthy to mention that the developed business operational manual served as reference material in the conduct of training and mentoring of future investors interested to engage in similar business, using the PHilMech developed corn mill technologies.

## **RESULTS AND DISCUSSION**

## **Evaluation and Selection of Project Cooperators**

The list of evaluated project cooperators is presented in Table 1.

Table 1. List of evaluated	potential	cooperators
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Entity/Cooperative Name	Location
1. Lucky Gam Agritrade Co. AMIA	Sta. Rosa, Laguna
2. Mr. Jesus Casangcapan	San Rafael, Bulacan
3. Ilocos Sur Corn Cluster Association Inc.	Vigan City, Ilocos Sur
4. San Jose Multi-purpose Cooperative	San Jose, Caba, La Union
5. Kibalagon Rural Improvement Club-	Kadingilan, Bukidnon
Multipurpose Cooperative	
6. Mabunga, Imbatug, Salimbalan District	Baungon, Bukidnon
(MISAD) Multipurpose Cooperative	
7. St. Joseph House of Spirituality Farmers	Sta. Maria, Isabela
Credit Cooperative	
8. Mr. Edwin P. Paningbatan	San Carlos City, Pangasinan
9. Agrarian Reform Beneficiaries and	Aglipay, Quirino
Developers Multipurpose Cooperative	
(ARBD-MPC)	

Based on the evaluation and selection criteria as discussed in the methodology, the first batch of identified project cooperators were St. Joseph House of Spirituality Farmers Credit Cooperative (JHSFCC) in Isabela and Mr. Jesus A. Casangcapan in Bulacan. Majority of JHSFCC members are planting white corn. The municipality of Sta. Maria, Isabela is known for traditionally consuming white corn grits as their staple food. The cooperative even supplied the corn grits product needed by the DA National Corn Program in one of their promotional exhibits in Manila. The JHSFCC mill their produce using a more than 50-year old corn mill in their municipality. On the other hand, Mr. Casangcapan is one of the perennial corn traders in Bulacan. He buys corn grains in Pangasinan and Tarlac and sell them to known feed millers in Bulacan.

For the second batch, the identified project cooperators were the ARBD-MPC and Mr. Edwin Paningbatan. The members of ARBD – MPC are planting yellow corn and are engaged in providing agricultural inputs like fertilizers, certified seeds, among others to its members. Mr. Paningbatan, on the other hand, is a corn farmer

and former regional corn program coordinator in DA-RFO III with vast experience and technical know-how on corn production and marketing of corn products.

After informing the above mentioned cooperators of their selection, series of meetings were conducted for the detailed presentation of the project and discussion on the provisions of the draft Memorandum of Agreement (MOA). It was ensured that the MOA was signed between PHilMech and the project cooperators before deploying the corn mill facilities in their area.

# Setting -up of Corn Milling System of the CGPE

# Installation of Facilities

As part of the partnership with the project cooperators, the needed facilities for the establishment of corn grits processing enterprise were provided by the project (Figure 2a & 2b). It was reiterated to the project cooperators that the ownership of the corn mill and the pre-cleaner shall remain with PHilMech, though, the project cooperators have the option to own these facilities as maybe agreed upon with PHilMech. Such ownership clause is vital in complying the government accounting rules and regulations in securing the property owned or procured by the government in this project.

Before the turn-over of these facilities with the project cooperators, debugging and fine tuning activities were conducted to ensure the efficient performance of the machines during operation. Modifications were particularly done at the degermer assembly and pre-cleaner to warrant high degerminator efficiency and continuous flow of corn grains during pre-cleaning, respectively. The appropriate "setting" for the continuous operation of milling were established during testing, particularly, the control mechanism of the elevator, degermer and rotary mill assemblies. It is worth mentioning that the test material used during the debugging process was provided by the project cooperators.



Figure 2a & 2b. The electric motor-driven and engine driven PHilMech compact corn mill system that were installed in Aglipay, Quirino and San Carlos City, Pangasinan, respectively.

# Training of Personnel on the Operation and Maintenance of the Facilities

Hands-on training on the operation, repair and maintenance of the compact corn mill and pre-cleaner were conducted to make sure that the project cooperators are capable of properly operating and maintaining the corn mill facilities. The procedures and get-around steps on repairs and maintenance of the identified components were taught. The training was done several time to fully gauge the absorption of knowledge of the trained operators especially on maximizing the capacity of the machine. The training has led to the capacity-building of the selected personnel, which consequently, generated specific jobs based on the skills that they learned.

# Development of Business Plan and Business Operational Manual of CGPE: The Case Study of ARB-Multi Purpose Cooperative, Aglipay, Quirino

# Conduct of Market Survey

Market survey in the nearby municipalities of the project site was conducted through field interviews with different store owners (e.g. agriculture and veterinary supply stores, grain stores and market stalls) who are currently engaged in the marketing of corn grits. The market research was conducted to characterize the customer segment of the CGPE.

Data gathered during the market survey are the following: 1) variants of corn grits sold; 2) wholesale price of corn grits from suppliers; 3) supplier/s of

corn grits; 4) retail prices of corn grits sold; and 5) weekly volume requirement of corn grits. Supplemental questions were asked regarding the characteristics, expectations and requirements of the customers in terms of the available corn grits in the market. Further, the interviewed store personnel were asked regarding their willingness to be part of the distribution channel of CGPE in marketing corn grits product. The volume requirement and average price of corn products in the nearby municipalities of Aglipay, Quirino, are presented in Tables 2 and 3.

The data gathered during the market survey in the area were used in the projection of volume of production or level of operation of the CGPE. Further, the data gathered provided an overview of the inclinations and volume requirements of such particular market segment on corn grits products and by-products. During the market survey, it was discovered that some stores sell corn grits at high price relative to its quality. Some stores sell corn grits with high presence of bran, tip cap and bits of corn cobs and other impurities such as stones, debris and even rice grains. It was also noticed that the sizes of the corn grits are irregular and not uniform. Conversing with customers and storekeepers, it was revealed that customers prefer corn grits that are relatively uniform in size and with less sharp edges as this will aid ingestion by the animal during feeding.

	Volume Requirement per week (in kg)					
Customer Segment	Cracked Corn	Cracked Coarse Corn Corn Grits		Total		
Cabarroguis —	108	216	217	541		
Aglipay	56	112	112	280		
Diffun	68	133	133	334		
Cordon	66	133	133	332		
Santiago	240	280	275	795		
Maddela	50	60	50	160		
TOTAL	588	934	920	2,442		

Table 2. Target market outlets of corn products in the nearby municipalities of Aglipay, Quirino

Customor	Average Price (in Php)				
Segment	Cracked Corn	Coarse Corn Grits	Fine Corn Grits	_	
Cabarroguis	25.00	25.00	25.00		
Aglipay	25.00	25.00	25.00		
Diffun	24.00	24.00	24.00		
Cordon	24.00	24.00	24.00		
Santiago	22.75	22.75	22.75		
Maddela	22.30	22.30	22.30		
AVERAGE	23.84	23.84	23.84		

Table 3. Average price of corn products in the nearby municipalities of Aglipay, Quirino

## Value Proposition Canvass

Based on the results of market survey, the value proposition canvas of the CGPE was then formulated (Figure 3). It is important to note that the identified customer segment is the backyard farm owners of game farms, poultry farms, piggeries or backyard farms that in need of quality corn grits for their animal. As identified, one of the pains of that particular customer segment is they are forced to patronize corn grits product of their suppliers despite the high price and inferior quality corn grits in the area. Such quality requirements of corn grits by that customer segment can be totally supplied by the CGPE as it produces graded and quality corn grits product.



DESIGNED FOR: Utilization of PHilMech-

Figure 3. Value proposition canvas of the Corn Grits Processing Enterprise

# **Business Model Canvas**

After the creation of the Value Proposition Canvas, the Business Model Canvas (BMC) was developed (Figure 4). It is important to note that the value proposition of CGPE is to produce high quality, graded, and uniform-sized corn grits for animal feed consumption utilizing the PHilMech compact corn mill technologies. As already identified, the target customer segment of the CGPE are the backyard farm owners of game fowl owners, poultry farms, piggeries or backyard farms that purchase feeds for their animals.

The distribution of products was realized through traditional marketing channel such as agricultural and veterinary supply stores, market stalls, and store owners. These kind of channels are engaged in marketing of animal feeds through consignment agreement. In order to gain and maintain customers in the process, discount schemes was imposed for bulk orders. The ARBD-MPC facilitates its own marketing channel through order and delivery using its own network of customers.

The CGPE maintains its key partners to commence the operation of the business. PHilMech and DAR-Quirino are among the key partners, as they provided the machinery and technical guidance. The organization of the CGPE is also an

integral partner as the human workforce have come from its members or sourced out through an agreement with its members. Further, an underlying requirement from the organization that help the CGPE thrive is the trust and support of its members.

To realize the income of the CGPE, the corn grits were sold on cash basis. Since it involves the sale of a consumable product, this resulted to transactional sales from one-time customer payments. Table 4 shows the retail price of the corn grits products of ARBD-MPC:

### **Business Plan**

After the preparation of the business model canvass, a comprehensive business plan was prepared for the operation of CGPE in this project.

#### Key Partners

<u>PHilMech</u> √ provision of the machine

v provision of technical persons
 for capability building

Local Government Unit V assistance in promotion and market linkages

Cooperative/Association V source of raw materials V human workforce V trust

#### Key Activities

#### <u>PHilMech</u>

 V Procurement and warehousing of quality corn grains
 V Processing of corn kernels into corn grits
 V Packaging and marketing of corn grits

#### Key Resources

V PHilmech compact cornmill
 V Technical assistance provided
 by PHilMech
 V Human capital for different
 operations of the CGPE
 V Raw materials (Yellow Corn Grains)

#### Value Propositions

Production of cracked corn and corn grits that is: V <u>High quality</u>: degermed well, therefore clean; produced using Class A corn kernels V <u>Graded</u>: corn grits are readily graded to Corn Grits No. 6-8, No. 10-12 and No. 14-18. V <u>Uniformity</u>: uniform in sizes

upon size reduction with less sharp edges, making it easier for animal consumption.

Help out local community with new business opportunities through: V Job generation

V Procurement of local farmers' harvest

Customor Polationships	Customor Sogmonts	Cost Structuro
Customer Relationships V Quality assurance guaranteed V Consignment arrangement through retailers V Accommodation of walk-in customers and inquiries V Dedicated phone number and Facebook page for quick inquiries and transactions Channels V Order and delivery V Consignment with local agrivet supplies retailers V Supplier for custom feed manufacturing	Customer Segments  V Game fowl owners V Poultry farm owners V Backyard farm owners V Customers with capability and willingness to pay to purchase quality cracked corn and corn grits V Personal consumption for the supply of raw materials for the formulation of feeds for game farm,	Cost Structure What are the most important costs inherent to our business? Assumptions: Farmgate Price: Php 14:00 for yellow corn (dried) Admin Cost: adopter's prerogative Total Production Cost Milling Cost: P1.00 Packaging Cost: P0.20 Transportation Cost: P0.50
	<ul> <li>piggery, poultry, etc.</li> <li>Suggested Retail Price: <ul> <li>Cracked Corn: Php 23.00 for retail</li> <li>Coarse Corn Grits: Php 23.00 for retail</li> </ul> </li> <li>Fine Corn Grits: Php 23.00 for retail</li> <li>Darak: Php 15-17.00 for retail</li> </ul>	

Figure 4. The Business Model Canvass of the CGPE

As discussed in the business plan, the ARBD-MPC commenced in the marketing of corn grits of different sizes, namely; (1) cracked corn; (2) coarse corn grits, and; (3) fine corn grits. The corn grits products were packed and sold in a 40-kg nylon sacks. The products were sold to different market outlets in the proximity of Aglipay, Quirino and its nearby municipalities. The target market channels of corn grits products of the CGPE are agricultural and veterinary supply stores, and grain stores.

Table 4. ARBD-MPC retail price of corn grits products

Corn Products/By-products	Price (Php)/kg
Coarse corn grits	20-23
Fine corn grits	20-23
Corn Flour	18-20
Darak	15-17

It is important to note that in the business plan, the customer segment of the CGPE is highly defined. However, given the level of operation during its first year in business, the CGPE opted to target market channel nearest to the cooperative and directly targeting individual customers undertaking backyard farms. The cooperative used a strategy called "Penetration Pricing", wherein the business have offered low prices for the corn grits products to enter the market, and subsequently, gain market share. Consignment arrangement was applied in the transactions with stores. Delivery and payment of corn grits were done every two weeks. As for walk-in customers, a discount was applied for bulk orders for all corn grits sizes, wherein a deduction of Php 1.00 per kilo was given as discount for orders of 10 kilos or more.

As contained in the business plan, the total annual capacity of the corn processing enterprise that was used in the analysis was only 118,800 bags of corn grains. This is a highly conservative estimate considering that this is based on total annual operating time only of 396 hours (at 4 hours per day, 4 days per week, 4 weeks per month and 6 months per year operation). Moreover, it was assumed that during its first year, the CGPE operate only at 10% of its full capacity with a total production of corn products at 8,970 kg; then increasing to 20% for the 2<sup>nd</sup> year, 30% for the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> year, respectively (Table 5).

Particulars	Year 0	Year 1	Year 2	Year 3-5	Year 6-7	Year 8-9	Year 10
Percent operating time per year at full capacity*	0	10	20	30	40	60	80
Volume of corn products (kg)	8,970	8,970	17,940	26,910	35,880	53,820	71,760
Total Cash Inflow Cash Outflow Net Cash Flow	680,000 (680,000)	289,362 258,906 30,456	590,784 497,011 93,772	886,176 735,117 151,059	1,181,568 973,223 208,345	1,772,351 1,449,434 332,917	2,277,023 1,925,645 351,378

Table 5. CGPE projected level of operation per year and estimated cash flow

\* Note: Maximum time of operation per year is assumed at 396 hours only.

Per result of financial analysis of the business plan, it was determined that the CGPE required a total capital of Php92,991 for its four-month of operation, 56.7% of which (Php 56,765) is needed for the procurement of corn grains. The total fixed capital needed for the establishment of the CGPE is Php 680,000. Note that in this set-up, PHilMech provided the compact corn mill and pre-cleaner having a total value of Php 480,000.

Even at very conservative estimate of 40 hours and 80 hours of operations for its first and second year, respectively, (Table 5), the result of financial analysis indicates that the CGPE will generate a positive cash flow of Php 30,456 during its first year and Php 351,378 on its 10th year of operation. The estimated Net Present Value of establishing and operating the CGPE with initial capital investment of Php 680,000 and at annual discount rate of 8% is Php 475,896, with an internal rate of return of 18.52%.

# **Development Business Operational Manual for CGPE**

The development of business operating procedures is highly vital in the sustainable operation of the CGPE. Most importantly, the developed business operating procedures and systems are critical for the easy setting up of the same type of business in the future using the PHilMech developed compact corn mill system.

The business operational manual of the CGPE is the product of documentation of the different business operations of the CGPE, as follows: (1) procurement of corn grains; (2) warehousing of corn grains; (3) milling for the production of corn grits; (4) packaging of corn grits; (5) marketing of corn grits; (6) accounting, and, (7) recording of financial transactions.

Each major activity was defined in the context of the CGPE. Sub-activities were listed in chronological order of action. A map of all the sub-activities is included to serve as guide for the target user/cooperator. It is then followed with the standard operating procedures (SOPs) for the defined sub-activities. Necessary steps were distinct, along with the necessary equipment needed to accomplish such task.

The development of the business operational plan also begets the definition and delegation of specific duties and responsibilities of personnel involved in the operations of the CGPE. This was also reflected in the business operational manual, example of one of the processes/activities is shown in Figure 5. Persons involved in each activity were identified and their roles were well defined. Clearer roles and responsibilities led to the establishment of hierarchy in the decision making that the CGPE require on its continuous operation. It also improved the operational performance of the enterprise as there are no overlapping of responsibilities among personnel. Each activity undertaken by the CGPE was assigned to specific persons. Accountability was also established.



### Figure 5. Sample content of the CGPE's Business Operational Manual

In the business operational manual, for example as illustrated in Figure 5, the classifier is responsible for the procurement of corn grains. For the CGPE to produce high quality corn grits, the classifier shall assess and inspect carefully and thoroughly the corn grains prior to procurement. In the process, personnel involved in the operation of the CGPE were compensated on a "per kilogram" basis.

Forms dedicated to a specific activity was incorporated in the manual, sample of which is shown in in Figure 5. Forms are documents that were used for recurring activities of the CGPE for recording, checking and balancing purposes. Such forms were structured to be supplied with information integral to a given activity. Steps on how to fill-up each form and to whom it is distributed were defined in the manual. Color coding was utilized in the steps of filling up of forms for ease of understanding and to avoid confusion during the entry of data. Important notes were also emphasized in key activities of the operations, such as: 1) the strict implementation of the "First-In-First-Out" for the corn grains and corn grits, and; 2) the reminder of not rounding down or rounding off of weight measurements during procurement and milling activities.

To illustrate (Figure 5), the Corn Purchase Slip (CPS) is structured in facilitating the purchase of corn grains from farmer-members of the cooperative. Basic data or information such as date, name and address of the farmer shall be filled up. The CPS number shall serve as a reference number for recording and checking purposes. In the manual, the number of bags, determined moisture content (in percent), weight (in kilograms), price per kilogram and total amount will be supplied during the actual procurement of corn grains. At the bottom of the CPS, the Procurement Officer is the designated personnel to prepare the form and shall be received or attested by the farmer-member for truthfulness.

# Development of the Operators' Manual for the Corn Mill System

Actual operations of the corn mill system by the ARBD-MPC were documented. This was the first documentation for the long-term use of the engine-driven model of the corn mill. In the process, the overall operations of the new corn mill system were assessed and evaluated. For components that give close attention and are more consumable, the standardization of the procedures in repairs and maintenance is imperative. As such, an operators' manual was developed. Additional procedures were added in the operations of the corn mill. Proper installation of all components of the corn mill and maintenance of the engine were added. Troubleshooting of the machines was updated especially with the common problems encountered on having an engine as prime mover. The standardization of procedures in the operation, repair and maintenance has given a sense of clarity to the project cooperators. In the case of ARBD-MPC, they were able to operate with minimal breakdowns of the machine and conduct repair and maintenance on their own by simply referring to the developed manual. During actual operations, certain "tricks" were discovered during operation such as the right timing of opening the feeding shutter of the elevator assembly, degermer and rotary mill, which maximizes the capacity of the machine. In addition, simple innovations were done in loading corn grains to the feeding hopper of the precleaner. A stock platform that can accommodate three bags of corn grains was added on the side of the pre-cleaner to facilitate the easier loading of corn grains. Likewise, the usage of an extended catchment for bran, which is composed of three nylon sacks connected and threaded together have increased the volume of bran that can be handled by the corn mill.

# Actual Business Performance of the Corn Grits Processing Enterprise

With the machine and business plan in place, and the gradual introduction of business operating system, the CGPE started immediately the procurement and processing of corn grains. The ARBD-MPC was able to procure 1,737 kg of corn grains at Php 25,707.60 for November to December 2019 and 1,574 kg at Php 20,157.50 for January to February 2020 only. Note that strict quarantine restrictions in Luzon on March 16, 2020 due to COVID-19 pandemic was imposed. Since then, business operations in the entire country were never normalized as of this writing.

The corn grains were sourced among the farmer-members of the cooperative. During its four months of operation, the CGPE was able to process all the procured corn grains into corn grits. Actual operations yielded an average milling recovery of 70.34 %. The corn grits processed were then subjected to marketing to the identified customer segment. Walk-in customers were accommodated in the ARBD-MPC office and transactions were facilitated and conducted on site. Delivery of 40-kg packed corn grits was also conducted to partner stores under consignment agreement.

In the process, CGPE/ARBD-MPC was able to sell all their processed corn grits and generated total sales of Php 45,857.50 during its four months of business operation. This actual performance clearly indicates that the established CGPE is financially viable based on the financial analysis in the business plan. The estimated internal rate of return is 18.52% and Net Present Value of Php 475,896 for a 10year business operation is highly realistic. Note that the IRR and NPV were based on a very conservative assumption that the CGPE shall operate only for a total of 40 hr and 80 hr per annum during its first and second year of operation.

It is important to mention that the duration of this project was only two years that covers the selection of project cooperators, set-up the processing facilities, prepare the business plan, train the management team, operate and analyze the business operation of the CGPE.

While the project duration was too short to complete all the activities of the project, the CGPE still reached the 'Existence Stage' of business operation as discussed in the methodology of the project and as described by Churchill and Lewis (1983).

As emphasized, existence stage is the point when the owner does everything and directly supervises subordinates, who should be of at least average competence. Among the key indicators-issues pointed by Churchhill and Lewis under this stage are as follows: "Can the enterprise get enough customers, deliver products, and provide services well enough to become a viable business? Can business expand from that one key customer or pilot production process to a much broader sales base? Do the business have enough money to cover the considerable cash demands of this start-up phase?"

The above indicators pointed by Churchhill were fully satisfied, and thus, the CGPE has indeed reached the 'Existence Stage' of the business level.

# Socio-economic Factors that Affects the Sustainable Operation of CGPE

Based on the actual operation of the CGPE, the following socio-economic factors may affect the sustainable operation of the business:

# Technical Know-how of Operators

Any disregard, malpractice or neglect of established procedures for the operation of the compact corn mill may be detrimental to the whole enterprise. Incorrect procedures/skipping of steps and incorrect adjustments during the operation would heavily affect the performance of the corn mill. Such may cause some parts to break, which consequently, lead to downtime. Safe and proper operation is rooted to the comprehensive training of the operators. Series of mentoring and coaching were conducted to fully train the project cooperators on the proper operation, repairs and maintenance to ensure the safety of the

operators and achieve optimum performance and lifespan of the compact corn mill system.

# Adoption of Business Operating System

The introduction of Business Operational Manual that contains the necessary protocols, system and procedures per every transaction made the operation of CGPE systematic and efficient. The procedures and system in the business operation manual were presented in simple and straightforward manner so that even an ordinary personnel can understand. The incorporation of forms for different activities facilitates the easy preparation of report particularly for accounting and monitoring purposes.

In particular, the adoption of the business operation system will improve personnel performance in the long run. Increased performance by the employees exemplifies the upward trajectory of the enterprise leading to gradual increase in profitability. With this, personnel may be compensated more depending on the performance of the CGPE.

# Appropriate Marketing Strategies

Effective marketing begins with a considered, well-informed marketing strategy. Profiling of the customer segment and fully understanding the competitive advantage of the CGPE have paved the way in setting the overall direction and goals of the CGPE. In the case of ARBD-MPC, profiling the customer segment helped in strategizing on which segment to focus. With the right marketing plan, it eliminates the unnecessary investment on fixed asset and out-sourced the delivery of corn grits products to its customers, instead of buying new delivery trucks.

Appropriate pricing strategies were also identified based on the results of the market survey. Ideally, price skimming may be employed upon the entry of the CGPE to market since it produces better quality corn grits compared with majority of the available corn grits in the market. However, this will not be attractive to customers with an imprinted mental notion that "it is just corn grits". A more appropriate entry pricing strategy is competitive pricing to become more profitable.

# Number of Hours of Operation

The financial feasibility of the compact corn mill is highly dependent on its rate

of utilization or annual operating time. As highly evident in Table 5, the lower the time of operation, the less corn grains that can be processed and eventually lesser net revenue of the CGPE.

# Woes on Raw Material Procurement

The enterprise, being so dependent on the raw materials that will be processed into corn grits, should be stressing the importance of quality control. However, with the corn industry being dominated by the "big players", getting quality corn grains may be difficult, especially for the private-owned CGPE. Given the scale of operation of the CGPE and the different circumstantial factors for farmers (e.g. need of immediate money), sources of corn grains may opt to sell their produce to bigger companies, hence, leaving the CGPE with small margin to procure raw materials for the CGPE.

# Marketing Woes due to Stiff Competition

As a start-up business venture, it is a daunting task to introduce a product to an almost saturated of a pre-dominantly oligarch-type industry. One identified problem of the CGPE is the introduction of the products to the market. Competition comes in the form of other corn grits producers from different areas. Competing with established corn mills is difficult since their network of clients has already been established despite the good quality corn grits that the CGPE can offer.

#### CONCLUSION AND RECOMMENDATIONS

Appropriate milling machines are vital in empowering the Filipino farmers to engage in value adding activities. The PHilMech compact corn mill and the precleaner technologies were primarily developed so that the Filipino farmers can process their own produce and sell corn grits instead of corn grains. The provision of value adding activities was envisioned to increase the income of farmers in their farming activities.

To showcase the appropriateness and effectiveness of the PHilMech compact corn mill and pre-cleaner technologies, a financially viable corn grits processing enterprise was established. While the project duration was only two years and the observance of strict quarantine restrictions during the last year of project implementation, the established CGPE still managed to reach the 'Existence Stage' of the business as described by Churchill and Lewis.

In transforming the cooperative into a viable corn grits processing enterprise, a business model canvas was introduced. The business model canvas became a powerful tool in understanding the right business model in a straightforward, structured way. As the business model became clearer, the preparation of a comprehensive business plan for the CGPE became easier. These business instruments have paved the way for this kind of start-up business to easily take-off and successfully reached the 'existence stage'. It effectively generate revenues with positive income during its initial stage of operation. This actual performance clearly indicates that the established CGPE is financially viable, as reflected in the financial analysis of the business plan. The estimated internal rate of return is 18.52% with Net Present Value of Php 475,896 for a 10-year business operation, initial capital investment of Php 680,000 and annual discount rate of 8%. Note that the IRR and NPV was based on a very conservative assumption that the CGPE shall operate only for a total of 40 hours and 80 hours only during its first and second year of operation, respectively.

The incorporation of forms to be used for the operation of the CGPE provided a systematic way of recording and accounting of transactions. The technical knowhow of cooperators on the business operation of the CGPE was further improved through the development of the Business Operational Manual. The identification of major activities of the CGPE brought about the order of tasks and personnel needed to accomplish such. The delegation and definition of tasks for personnel involved provided specified functions for the organization to operate more efficiently, without overlapping of involvement. A simple and practical procedures and system make the operation of the CGPE cost efficient and competitive.

The Operator's manual on the operation and maintenance of the PHilMech compact corn mill and the pre-cleaner, on the other hand, became an effective medium of educating the project cooperators on the proper operation and maintenance of these developed technologies. This optimized the performance of these technologies with respect to the operation of the CGPE.

The preparation of different manuals is one of the major output of the project that will be used in the promotion and commercialization of the PHilMech compact corn mill with pre-cleaner in the future. These manuals could be used for the following:

- 1.) Business plan serves as template in the preparation of business plan for future investors of the technology;
- 2.) CGPE Operating System Manual serves as manual in training and mentoring the future investors on the business operation of the CGPE; and,
- 3.) Corn Mill Operator's Manual serves as manual in training and mentoring the future investors of the technology.

Finally, this "model corn grits processing enterprise" will eventually serve as learning site of PHilMech and the government, in general, for the sustainable promotion and commercialization of the above mentioned technologies.

# LITERATURE CITED

Audretsch D. B. and M.C. Keilbach, E.E. Lehmann. 2006. "Entrepreneurship and Economic Growth". Oxford University Press.

Audretsch, D. "Innovation and Industry Evolution". 1995. Cambridge: MIT Press.

- Barret K. "Business Analysis: The Foundation for Business Success". International Institute of Business Analysis (IIBA). https://www.iiba.org/Careers/Careers/ Business-Analysis-the-Foundation-for-Business-Succ.aspx. Accessed October 12, 2017
- Churchill, N. C. and Lewis, V. L. 1983. "The Five Stages of Small Business Growth". Harvard Business Review.
- Asian Productivity Organization. 2005. "Creative Entrepreneurship in Asia", Editor Tan Wee Liang. Tokyo, Japan.
- Department of Agriculture. 2018. Updated Roadmap of the National Corn Industry in the Philippines. Quezon City.
- Bureau of Agricultural and Fishery Engineering, Department of Agriculture. 2016. Committee Report on the State of Agricultural Machineries Distributed Under Corn and Rice Programs of DA. Quezon City.
- Gragasin M.A. and Martinez R.C. 2017. Pilot-Testing of Developed Village-Level Compact Corn Mill in the Philippines. ARPN Journal of Engineering and Applied Sciences, 12(1): 83-88
- Gragasin M.A. and Martinez R.C. 2015. Development of Corn Mill for Village-Level of Operation. Asian Journal of Applied Science, 3(6): 896-904
- Hartman J.C. and Schafrick. 2004. The Relevant Internal Rate of Return. The Engineering Economist. 49(2): 139–158.
- McGrath R.G., and MacMillan I. 2000. "The Entrepreneurial Mindset". Harvard Business School Press.
- Osterwalder, A. 2004. "The Business Model Ontology A Proposition In A Design Science Approach". PhD thesis University of Lausanne.

- Osterwalder, A. and Pigneur, Y. 2003. "Modeling Value Propositions in e-business", ICEC '03 Proceedings of the 5th international conference on Electronic Commerce, pp 429-436Shumpeter, J. (1942). Capitalism, Socialism and Democracy. New York: Harper and Brothers.
- Shumpeter, J. "Capitalism, Socialism and Democracy". New York: Harper and Brothers. 1942. Strategyzer. "The Business Model Canvas". https://strategyzer. com/canvas/business-model-canvas. Accessed on November 2, 2017.
- Wikipedia. "Value Proposition". https://en.wikipedia.org/wiki/Value\_proposition. Accessed November 2, 2017.

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# About PHilMech

The Philippine Center for Postharvest Development and Mechanization, known then as the National Postharvest Institute for Research and Extension (NAPHIRE), was created on May 24,1978 through Presidential Decree 1380 to spearhead the development of the country's postharvest industry.

> As a subsidiary of the National Grains Authority in 1980, the agency's powers and functions were expanded in line with the conversion of NGA to the National Food Authority.

In 1986, PHilMech moved to its new home at the Central Luzon State University compound in Muñoz, Nueva Ecija.

The agency was transformed from a government corporation into a regular agency through Executive Order 494 in 1992. It was renamed the Bureau of Postharvest Research and Extension (BPRE).

For years now, PHilMech is engaged in both postharvest research, development and extension activities. It has so far developed, extended and commercialized its research and development outputs to various stakeholders in the industry.

With Republic Act 8435 or Agriculture and Fishery Modernization Act (AFMA) of 1997, PHilMech takes the lead in providing more postharvest interventions to empower the agriculture, fishery and livestock sectors.

Pursuant to Executive Order 366 or the government's rationalization program in November 2009, BPRE became the Philippine Center for Postharvest Development and Mechanization (PHilMech) with twin mandates of postharvest development and mechanization.

#### For more information, please contact:

#### **Executive Director**

Philippine Center for Postharvest Development and Mechanization CLSU Compound, Science City of Muñoz, Nueva Ecija Tel. No.: 0917-813-0852 Fax No.: (044) 456-0110 Website: www.philmech.gov.ph

