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PROMOTION OF DEVELOPED POSTHARVEST TECHNOLOGIES FOR SUSTAINABLE COMMUNITY-BASED COFFEE PROCESSING ENTERPRISES

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ABSTRACT

The project was conducted to promote the adoption of developed postharvest technologies to improve quality of coffee beans, increase income of farmers in order to attain sustainable community-based coffee processing enterprises models. Two coffee farmer organizations: Casile Guinting Upland Multi Purpose Cooperative (CGUMC) Cabuyao Laguna; and Bokod, Boboc Organic Arabica Coffee Processors and Growers Association Incorporated (BBOACPGAI) Bokod in Benguet served as cooperators. The project harmonized government efforts, developed business models integrating postharvest technologies/ system, enhanced entrepreneurial and managerial capability of farmers, conducted market promotion/linkages and other cross cutting activities. Changes in the postharvest practices of farmers, quality of coffee beans, socio-economic viability, financial viability and political support were documented.

After four years, 220 men and women farmers adopted the technology. Farmer adopters gained added income of Php31,888.89/ha and Php7,133.33/ha. The CGUMC-CBCPE business model is profitable with payback period of 4.07 years, Php2,149,410.31 NPV, 32% IRR, 1.44 BCR and 40.34% ROI. The BBOACPGAI- CBCPE business model is also profitable payback period of 6.51 years, Php107,989.04 NPV, 17% IRR, 1.03 BCR and 7.07% ROI quality of coffee beans sold in the market were improved, job opportunities to women members was generated value adding and branding of local coffee was promoted. Government efforts were harmonized and its cross-cutting activities facilitated widespread dissemination of information, sharing of best practices and production of knowledge products.

PHilMech must continue to establish viable CBCPEs adopting postharvest technologies in other coffee growing regions. Results of the two successful CCBCPEs can be developed into investment packages and serve as guide/manual to other coffee adopters/investors.

INTRODUCTION

Coffee is considered the second most valuable commodity next to oil. The Philippines used to be the 10th coffee producing country. It grew all four major types of coffee (Arabica, Robusta, Liberica and Excelsa). According to PHilMech an estimated 30 to 40% of our coffee are produced by small coffee growers in rural communities from a number of coffee trees planted in their backyards. Majority of these small farm production are unaccounted in the market because of the following reasons: (1) volume of harvest are too small to merit proper processing or even marketing ; (2) poor quality green beans, has low value thus, low income; (3) farmers were discouraged to maintain their coffee trees for better yield.(R. Paz, 2009). Hence, coffee farmers suffer low productivity and income while coffee traders and processors have problems on poor quality and limited supply. (De la Cruz, 2015).

Today, 70% of our coffee's requirement is imported. In 2017, the country's total imports was estimated at 100,000 to 135,000 MT (PCBI, 2017). To address the problem, the Department of Agriculture through the High Value Crops Development (DA-HVCDP) supported coffee farmers through expansion of production areas and provision of processing

facilities to farmer organizations. It was assumed that providing coffee processing equipment, training and other support services will promote collective marketing of coffee and gain income from value-adding activities. This led to the birth of coffee processing enterprises in the different parts of the country. However, the rate of utilization of the installed coffee equipment and facilities was low. Most of the farmers managing the coffee business performs varied range of tasks with no prior experience on managing a coffee processing enterprise, complains of insufficient working capital and lacks training on postharvest and processing of coffee.

PHilMech has developed a postharvest system (PH system) for Arabica and Robusta coffee and promotes its adoption in support to DA's coffee program. The PH system consists of match of equipment like coffee pulpers, dryer, huller, moisture meter, sorting table and grading system suited for Arabica and Robusta coffee. Results on the study conducted by PHilMech for Arabica showed a reduction of broken beans to 2.73% compared to 14.23% using the traditional method. The GCB passing the system provides processors with better quality raw material essential for their value adding operations (Idago, et.al. 2010). The goal of this project is to contribute to the improvement of the Philippine coffee industry through technological and entrepreneurial interventions adaptable to local small coffee growers in the country. It will capitalize on the partnership and convergence of key players in order to attain a sustainable community-based coffee processing enterprises.

OBJECTIVES

General:

To establish a sustainable community-based coffee processing enterprise through the adoption of developed postharvest technologies/system and contribute to the improvement of the Philippine coffee industry.

Specific:

1. Establish the current operations and socio-economic characteristics of the coffee farmer and its organization, identify gaps and status of existing coffee equipment/ facilities;
2. Harmonize existing efforts of government agencies supporting the CBCPE to further improve business operation of the farmers
3. Develop business models integrating the recommended postharvest technologies/ system for coffee Arabica and Robusta in the farmer managed coffee processing enterprise;
4. Determine the effects of the project interventions in terms of changes in the post-harvest practices, adoption of technologies, improvement in the quality of coffee beans, socio-economic benefits, financial viability, and political support.
5. Identify problems encountered by the CBCPEs and their coping mechanisms

METHODOLOGY

Conceptual Framework

The general strategy of this extension project was to establish models of community-based coffee processing/trading enterprises in coffee producing areas processing Robusta and Arabica coffee. A farmer organization was selected as pilot cooperator for the "model" introducing the PHilMech's technological interventions and harmonized existing industry assistance by concerned government agencies. It was assumed that if the community-based coffee processing enterprise models become successful, then other coffee farmer organizations in other areas would follow and trigger multiplier effect in technology adoption.

Figure 1 shows the project's conceptual framework. The farmers farm and socio-demo characteristics of farmer cooperatives, resources of partner agencies serve as the Inputs. The Process covers all interventions like partnership and convergence of resources, capacity building and coaching and mentoring of farmers, promotion of recommended PH System for coffee, business model development, and cross cutting activities, The expected outputs are harmonized government efforts, enhanced technology adoption and utilization of equipment, improved quality of coffee beans, enhanced business and entrepreneurial capabilities of farmer's attain a profitable and sustainable community-based coffee processing enterprise thus increasing the income of farmers.

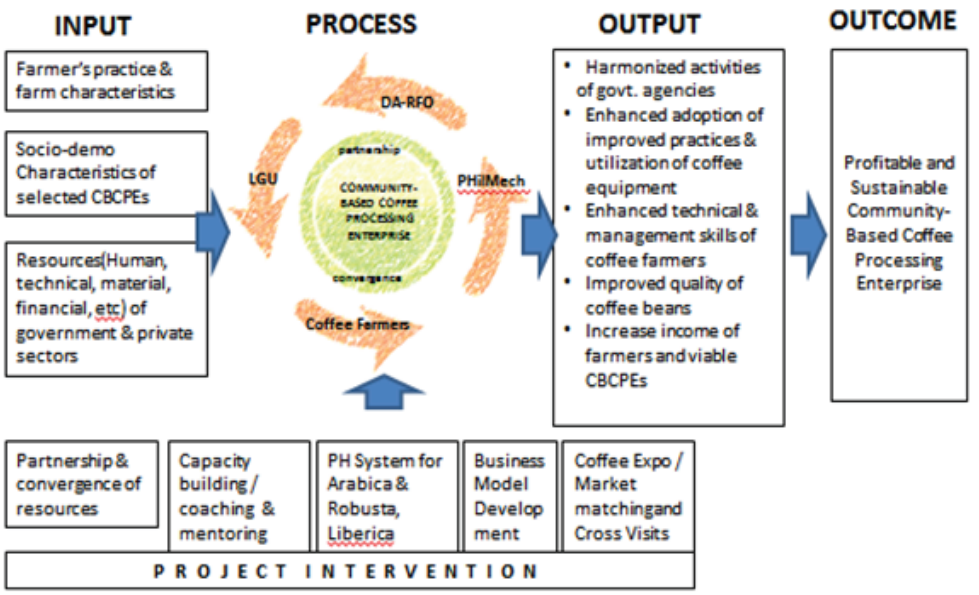

Figure 1. Conceptual Framework of the Project

Selection of Sites and Farmer Cooperators

The targeted sites and cooperators were taken from the shortlist of potential recipients of the DA-HVCDP, Php 2.0 M grant of coffee processing facilities and equipment to qualified coffee farmer organizations. The grant comprised of a building/processing center and coffee processing equipment like pulpers, hullers, moisture meter, dryers, etc. The farmer organizations who served as cooperators, were selected based on agreed criteria in consultation with the Focal Person of the DA-Regional Field Office, High Value Crops Development Program (DA-HVCDP).

The criteria for the selection of farmer cooperators were: (1) must be a registered coffee cooperative and has available lot for the construction of the processing building/center; (2) preferably with at least 11 ha of coffee bearing trees planted by farmer members; (3) willingness to invest and follow recommended postharvest practices and technologies; and (4) with active support from LGU.

Based on the set criteria the following were selected as farmer cooperators to be groomed as community-based coffee processing enterprise models (CBCPE) for a period of four years: (1) Casile Guinting Upland Multi Purpose Cooperative, (CGUMC) of Barangay Casile, Cabuyao Laguna; CBCPE model for Robusta coffee and (2) Bokod, Boboc Organic Arabica Coffee Processors and Growers Association Incorporated, (BBOACPGAI) Bokod, Benguet, CBCPE model for Arabica coffee

Established Partnerships and Convergence of Resources to Harmonize Existing Government Efforts

To harmonize existing efforts and encourage sharing of resources and expertise among partner agencies, the project established partnership and convergence and forged agreement with the DA-RFOs of the Cordillera Administrative Region, (CAR) and the DA-Region IV- A through the High Value Crops Development Program (HVCDP) together with the Local Government of Units of Cabuyao, in Laguna and Bokod, Benguet. For better understanding of the concepts and approaches of project implementation, a National Project Launching was held in Baguio City in April 2016, attended by representatives of DA-RFOs- HVCDP staff LGUs (MAOs and Agri Technicians) of Cabuyao and Bokod. The activity encouraged support from the partner agencies by forging agreement with PhilMech as project partners.

To ensure sustained support and commitment from partner agencies the following roles and responsibilities were drawn:

The DA- RFO HVCDP committed to: (1) assist PHilMech and act as co-implementer of the project on site; (2) organize a project team to assist in the conduct of targeted activities; (3) provide necessary technological and equipment /facility support such as (coffee pulpers, dryers (AWD/MCSTD), hullers, moisture meters, roaster, grinders, sorting tables

etc. processing building /center for efficient operation of the CBCPEs); (4) cost share with PHilMech in the conduct of training to enhanced capacity of farmers to manage their business and produce quality coffee; (5) monitor and evaluate the progress of the project.

The LGU at the project site committed to: (1) assist the farmers in setting up their own business management team and guide them in the attainment of their operational/ business goals; (2) promote the adoption of recommended production/post production practices and technologies to maximize use of installed equipment and facilities; (3) conduct regular meetings and consultation of farmers and provide feedback on the progress of their business operation; (4) assist farmers in the preparation of report and presentation to annual project assessments.

The Farmer Cooperators committed to: (1) operate and manage the CBCPEs as a business enterprise and hire /assign required manpower to run the coffee enterprise; (2) adopt recommended postharvest practices and appropriate machines/equipment; (3) develop a business plan and engage in processing/trading of quality coffee beans; (4) keep records of transaction and allow partner agencies to access data; (5) Ensure the active participation of the farmer members in the supply of raw materials attend meetings, trainings, as maybe required by government agencies.

The PHilMech committed to: (1) provide over-all direction in the implementation of project activities; (2) conduct capacity building activities to enhance the technical, organizational , business management, marketing and access to financing of selected farmer cooperators; (3) act as subject matter specialist in postharvest training, business planning workshops, preparation of business plans and others related to building successful CBCPEs; (4) organize annual project assessment and planning workshops, coffee exposition and cross visits to other successful farmer led coffee enterprises for mutual sharing of ideas, best practices, challenges and needs in producing quality coffee; (5) monitor and document progress of farmers and their processing business.

Formulation of the Implementing Mechanics for the Community-Based Coffee Processing Enterprises (CBCPE)

Identification of Gaps/Needs of the Selected CBCPEs

Together with the partner agencies, the project assessed the gaps/needs of the BBOACPGAI and CGUMC and gathered the following information: (1) baseline data of the farmer's (both men and women) postharvest and processing activities in their coffee farms, (2) cooperatives. operational activities (if there is any), (3) job carried out by men and women workers/leaders in the farm and processing center, (4) status of the equipment and facilities installed, (5) management and organizational issues etc. Results were consolidated, analyzed, and presented to the project team in the region as input to their regional plans.

Upgrade/Install necessary equipment and facilities for efficient operation

During the initial visit to CGUMC and BBOACPGAI, the project provided assistance on the following activities: (1) assessment on the existing equipment and facilities for coffee (if there is any), (2) conduct performance testing of coffee equipment and recommend installation/purchase of lacking equipment to ensure the production of quality coffee beans.

Promotion of PHilMech's Recommended Postharvest Technologies/System

The project also provided assistance to CGUMC and BBOACPGAI on setting the required operational set-up tailor-fitted to the type of coffee being planted, choice of processing method and their processing method. For easy access of facilities like drying, pulping and hulling operations, the project encouraged clustering of farmers depending on the geographic location of the farm For BBOACPGAI, the following postharvest practices/ technologies were recommended for their Arabica coffee.

1. Manual harvesting by hand-picking ripe berries 10-15kg. twice/week;
2. De-pulping using the portable, manually operated PHilMech rubber-bib pulper for ripe berries;
3. Fermentation of coffee beans within the 10-20 hour period;
4. Use of All-Weather Dryer (AWD) using polyethylene cover in drying of coffee parchment;
5. Use of rubber-roll huller for dry parchment coffee with 180 kg/h capacity to reduce mechanical damage;
6. Use of moisture meter; and
7. Use of sorting/grading tables.

Training and Capacity Building with On-the-Job Coaching and Mentoring of Farmer Cooperators

Various capacity building activities and training/workshops were conducted by the project in collaboration with the project partners to train the farmer members and equip CGUMC and BBOACPGAI with the knowledge and skills postharvest system, as well as coaced and mentored the business management team to become effective entrepreneurs. The capacity building activities cover the following topics: leadership and values re-orientation, organizational strengthening, technical skills enhancement, entrepreneurial skills and business management workshops, business action planning, market info/trends, coffee cupping quality assessment, proper record keeping etc. Aside from this the project also tapped other agencies like DTI (Kapatid Mentor Me), and coffee enthusiasts (Coffee Experts/Q Graders) for needed assistance to the farmers. The members of the project team composed of DA-RFO and LGU staff were also trained and given proper orientation to make them efficient partners/enablers.

Development of Business Model Tailor- fitted to the Community–Based Coffee Processing Enterprise

The project assisted the CGUMC and BBOACPGAI in crafting the business model to guide them to become a profitable community–based coffee processing enterprise (CBCPEs). Participatory approaches were adopted focusing on customers demand and the choice of market. Common to both CGUMC and BBOACPGAI were the integration of PHilMech's recommended postharvest system at the farm and coop level of operation. Part of the coaching and mentoring activities of the project was to teach the CGUMC and BBOACPGAI farmers on coming up with their own business plan complemented with on-the-job mentoring on product costing, computation for rental fees, proper record keeping, financial management, product presentation and market linkage for quality coffee beans and roasted coffee.

Cross Cutting Activities

Cross cutting activities such as coffee exposition, market matching and cross visits to successful farmer-led coffee enterprises were also conducted to: (1) promote the adoption of recommended practices and technologies to other farmers supported under the DA-HVCDP; (2) disseminate information via farmer –farmer encounter; and (3) develop learnings into knowledge products. It is a common knowledge that farmers will adopt improve practices if they saw other farmers doing it and benefit from it in terms of better price. The learnings and experiences of farmer adopters and the project itself can be used as valuable inputs in the development of knowledge products for dissemination of information and multiplier effect in technololy adoption.

Monitoring and Documentation on Progress of Enterprises

Participatory approaches in monitoring and documenting the project activities were conducted. This involved participatory observation, reflection, planning and action with the farmers and project partners/enablers. The developed tools in tracking progress of project implementation include: monitoring report of project staff, report of farmers accomplishments presented via PowerPoint and/or video presentation (testimonies/ experiences) of farmers adopting the recommended practices/ technologies.

Data Analysis

Two coffee farmer coops/organizations who served as project cooperators, whose initial postharvest practices and activities were determined before and after the project intervention. Using a prepared questionnaire, at least 15-25 active farmer members on each site were interviewed to establish their existing postharvest practices. These farmers were monitored throughout the duration of the project and asked the same questions during the final project assessment/evaluation. Likewise, the status and progress of the community-based coffee processing enterprises were analyzed and assessed in terms of changes in postharvest practices, improved quality of coffee beans, socio-economic viability, financial viability, political support and contribution to the community. The financial aspect involved the following analysis:

1. Partial budget analysis to measure the incremental changes in income associated with the use of the technology as against the traditional practice; and
2. Investment analysis – to measure the worthiness of the enterprises showing the following financial indicators (1) Payback period (PBP), (2) Internal Rate of Return (IRR) (3) Net present value (NPV) and (4) Benefit Cost Ratio (BCR).

RESULTS AND DISCUSSION

The Coffee Farmer Cooperators

Two coffee farmer organizations namely: (1) Casile Guinting Upland Marketing Cooperative (CGUMC) and (2) Bobok, Bokod Arabica Coffee Processors and Growers Association Inc. (BBOACPGAI) were selected as project cooperators. They were groomed to become viable community-based coffee processing enterprise models (CBCPE) for a period of four years. The CGUMC produced and processed Robusta coffee while BBOACPGAI produced and processed Arabica coffee.

Profile of the Casile Guinting Upland Marketing Cooperative (CGUMC)

The Casile Guinting Upland Marketing Cooperative (CGUMC), is located in barangay Casile, Cabuyao, Laguna around 10 minutes ride from People's Park of Tagaytay. The organization was registered in 1997 under the Department of Labor and Employment (DOLE) with a total of 62 active farmer members. Forty of the active members were female and 22 were male. The CGUMC farmers planted Robusta coffee with a total area of 48 hectares. In 2018, the cooperative recorded a total of 31,030 bearing coffee trees with additional 142, 560 trees non-bearing or newly planted. In the same year, the cooperative produced an estimated production of 13.5 MT of coffee beans.

Coffee Postharvest Practices and Processing Activities of CGUMC

Farmers harvest their coffee in two ways. The most common practice is harvesting by stripping where both ripe and green berries are taken from the coffee trees. Another practice is selective harvesting or priming where only the mature or ripe berries are taken from the coffee trees.

Majority of the CGUMC farmers practiced the traditional way of processing their coffee which include: (1) harvesting coffee berries by stripping method (removal of both ripe and unripe berries); (2) not practice floatation (to remove overripe or damaged berries); (3) drying of coffee in concrete pavements; (4) determine dryness of coffee by touch and feel of hands; (5) avail hulling services in the coop once in a while; and (6) sells dried coffee berries to the local market. The cooperative complains of low supply of raw materials for coffee roasting, and/or presence of poor quality coffee beans. Majority of the farmers sell their coffee to local traders in a form of dried berries. The practice of selling dried berries to local traders promotes the proliferation of poor quality coffee in the market and consequently, low price.

Coffee Equipment and Facilities Provided by the Dept. of Agriculture and DTI

In 2016, the Department of Agriculture 4-A and the Department of Trade and Industry (DTI) provided CGUMC with coffee equipment like 2 units steel pulpers; 1 unit MCSTD; 1 unit huller; 2 units moisture meter; 1 unit roasting machine (1 kg.) capacity and 1unit roasting machine (5 kg. capacity) an espresso machine and coffee grinders. The cooperative started selling packed roasted coffee with "Café de Cabuyao" as brand on a per order basis in small quantities. The cooperative has difficulty expanding their market because only few farmers sell their green beans to the cooperative thus, low utilization of installed coffee equipment and facilities. In 2016, price of Robusta dried coffee berries was P30/kg in Luzon and Mindanao, while price of coffee beans was higher in Luzon at P110/kg. compared to P50-70 kg. in Mindanao.

Bobok, Bokod Arabica Coffee Processors and Growers Association Inc.

The BBOACPGAI is located in barangay Bobok, Bokod La Trinidad Benguet. Majority of the members planted Arabica coffee with a total of 37.93 ha grown at an elevation of 500-1900 MASL. The cooperative has 57 active coffee farmer members 36 were female and 21 were male. The organization was registered in 2010 under the Department of Trade and Industry (DTI. In 2018, the cooperative recorded a total of 21,000 bearing coffee trees plus additional 46,445 trees non-bearing or newly planted. In the same year, the cooperative estimated a total production of only 3.5 MT of coffee beans. Aside from coffee the BBOACPGAI also planted vegetables and other rootcrops as additional income.

Coffee Postharvest Practices and Processing Activities of BBOACPGAI

Majority of the BBOACPGAI practiced the traditional way of processing their coffee. Among the postharvest practices include: (1) selective harvesting; (2) floatation to remove defective beans; (3) fermentation for 24 hours; (4) pulping by use of wooden pulpers; while few (8%) use mechanical pulpers; (5) drying in concrete pavement ; (6) traditional way (touch and feel by hands) to determine dryness of coffee; (7) hulling using mortar and pestle; (8) store coffee (dried parchment) for home consumption only; and (9) roasting and (10) grinding services of coffee roasters in Baguio City. Majority of BBOACPGAI farmers sell their coffee in the form of dried coffee parchment sold at P150/kg. to the local traders.

Coffee Equipment and Facilities Provided by the Dept. of Agriculture, 2016

The BBOACPGAI, received coffee equipment and facility assistance from DA- RFO CAR and other private donors. However, some of the equipment like coffee huller and coffee roaster were under- utilized due to the following: (1) low volume of coffee processed by the coop; and (2) no common building area to process their coffee. The processing building of BBOACPGAI was completed in 2018 and turned-over only to the farmers in March, 2019. PHilMech's contribution to the BBOACPGAI was the 12 units of rubber pulpers which the cooperative are still using up to now. While four units need replacement of rubber due to wear and tear.

In general, majority of the farmer members of CGUMC and BBOACPGAI practiced the traditional way of processing their coffee and did not practice consolidated marketing of their produce. Coffee was sold by farmers individually to local traders in the form of dried coffee berries, parchment or green beans with no consideration on its quality.

Business Models on Community-Based Coffee Processing Enterprise (CBCPE) For Arabica and Robusta Coffee

Using participatory approaches and convergence of efforts the project was able to develop business models tailor- fitted to the farmer cooperators choice of market and their capacity to manage the community-based coffee processing enterprise. Figures 2 and 3 describe the different business models of Community-Based Coffee Processing Enterprises (CBCPEs) established by the CGUMC, and BBOACPGAI as influenced by the project.

The CBCPE Business Model of Casile Guinting Upland Marketing Cooperative

The CBCPE Business Model of Casile Guinting Upland Marketing Cooperative describes an enterprise where the farmer cooperative buys the fresh and dried coffee berries from its cooperative members and process the coffee into packed roasted whole and ground coffee. (Figure 2).The dried coffee berries/parchment were sold by the farmer members to the coop, the coop in turn processed it using installed coffee facilities and equipment. This business model integrates the recommended postharvest technologies and system to both farm and cooperative level of operation. The cooperative hires its own business management team composed of trained cooperative members to manage the day to day operation of the coffee processing plant. The Coffee Processing Enterprise of CGUMC is being managed by a woman and employs additional three women workers/laborers and a machine operator who are also members of the cooperative. Women is known to be meticulous in doing tedious and detailed work like drying, sorting, grinding etc

The CGUMC takes pride in selling quality roasted whole and ground coffee with the brand name “Café de Cabuyao” to LGU Cabuyao as its number one customer. Other customers include pasalubong centers around Cabuyao and Tagaytay area and walk-in buyers. They maintain customer relations via face to face and/or using the social media. Distrbution channels were made on per order basis to ensure that the coffee sold is newly processed, either cash on delivery or consignment basis depending on the customer. The cooperative enjoys the support of DA-RFO 4-A, DTI, LGU, and other agencies in the govt. and even private sector providing continous coaching and mentoring in order to attain inclusive growth. The CGUMC plans to expand and offer new products in the market i.e (brewed coffee and ready to drink cold coffee latte).

In 2018, additional coffee equipment and facilities were provided by DA-RFO 4-A to CGUMC such as 1 unit sealer, 1 unit MCSTD, 1 unit steel huller (engine powered),2 units grinders, 3 units AWD installed in farmers farm. The processing building was inaugurated and turned over by DA- RFO to CGUMC. This encouraged farmers to promote quality coffee processing, increase their volume of production and boost their confidence to expand market.

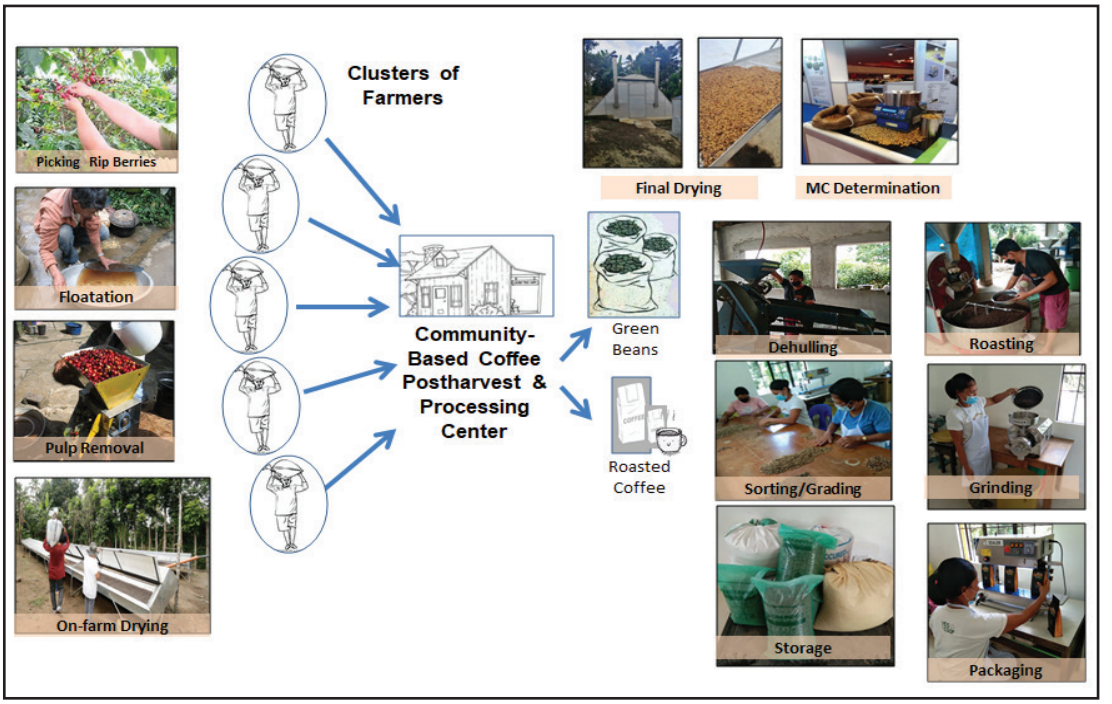

Figure 2. Community-Based Coffee Processing Enterprise Model of CGUMC

The CBCPE Business Model of BBOACPGAI

The CBCPE Business Model of BBOACPGAI describes an enterprise where the farmer cooperative buys the fresh and dried parchment from its cooperative members and process the coffee into packed roasted whole and ground coffee. They then sells roasted cofffee and dried parchment to specialty market. (Figure 3). The cooperative adopts the wet method of processing coffee. The BBOACPGAI buys either dried coffee parchment from the farmer members then the cooperative processes it using installed coffee facilities and equipment. This business model integrates the recommended postharvest technologies and system to both farm and cooperative level of operation. The cooperative hires its own business management team composed of trained cooperative members to manage the day to day operation of the coffee processing plant. The Coffee Processing Enterprise of BBOACPGAI is being run by a male manager and supported by volunteer workers/laborers and a machine operator who are also members of the cooperative.Like CGUMC the women members of the cooperative do the tedious and detailed work like drying, sorting, and packing of roasted coffee.

As illustrated in Figure 3, the BBOACPGAI was also successful in convincing its farmer members to adopt recommended practices (wet method) and sells/patronize the services of the cooperative. The group sells both dried quality coffee parchment and roasted coffee mostly on per order basis. The BBOACPGAI have created its brand name “Bobok Aroma” and advertised their products through social media, direct selling, and attendance to fairs and exhibits etc. The coffee processing activities of BBOACPGAI took off slowly because to the following reasons: (1) limited volume handled due to delays in the completion of the processing center and turn-over of the building to the coop; and (2) coffee equipment i.e. huller given by government agencies not match in terms of capacity and/or needs

modification to suit farmers reqirements. Like CGUMC, the BBOACPGAI is also managed by mostly women workers who handle important positions in the business.

The Bobok Aroma of BBOACPGAI garnered the highest score in cupping quality assessment conducted in the 2018 Coffee Expo. Inspired by the results of the cupping quality assessment, the BBOACPGAI vowed to increase their production volume and plans to aggressively sell their coffee in and outside Bokod. At present, The group also encouraged their LGU to buy their coffee and offer it as tokens in their visitors/clients creating a ready market of their coffee products.

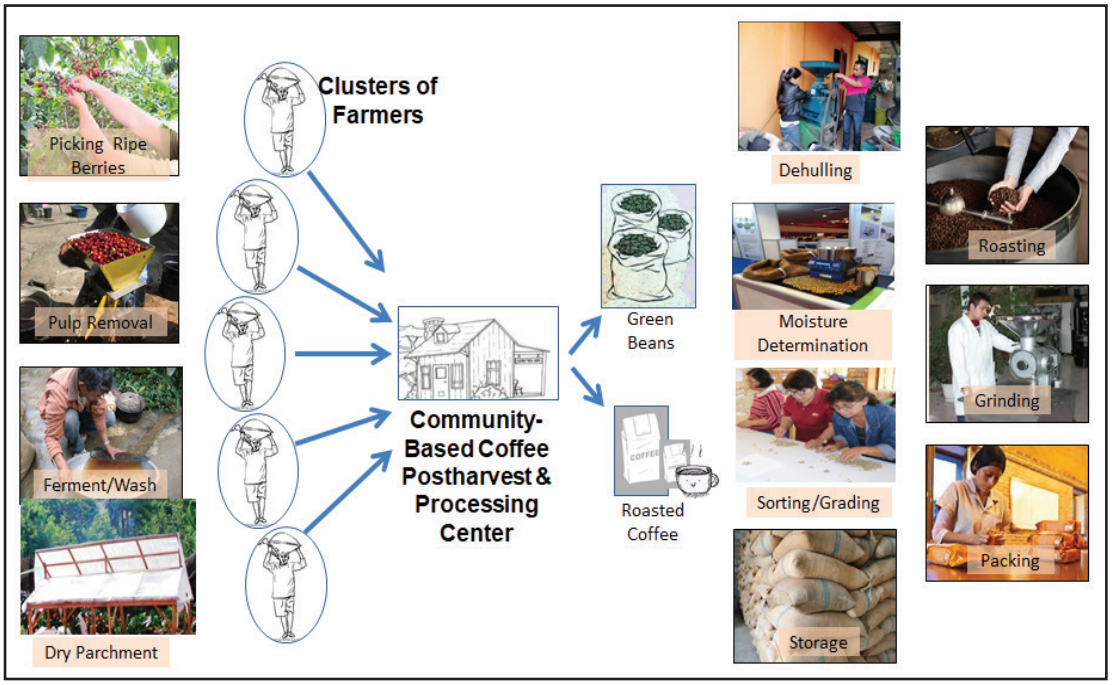

Figure 3. Describes the Community-Based Coffee Processing Enterprise Model of BBOACPGAI

Effects of the Project Interventions on the Postharvest Practices of Farmers at the Farm and the Cooperative Level of Operation of CGUMC and BBOACPGAI

Increase in the Number of Farmers of CGUMC Adopting Technologies

The changes in the postharvest practices of CGUMC farmers before and after the project is shown in Figure 4. Before the project, about 33% of the farmers adopted the semi-wet method; 73% of the farmers practiced stripping method of harvesting and this is mostly done by men. None of the farmers practiced floatation , removal of the overiped, empty or defective berries. A few farmers used wooden pulpers in pulping; 80% of farmers used concrete pavement in drying their coffee berries; 73% of the farmers practiced shaking, touch and feel in determining dryness of their coffee; 93% of the farmers used mortar and pestle in hulling their coffee sold as green beans; 87% of the farmers practiced sorting of beans.

After the project, 53% of the farmers adopted the semi-wet method; 80% of them already practice selective harvesting (picking only the ripe or mature berries of coffee). This is done by both men and women farmers. All farmers practice floatation to remove empty, overripe and defective beans, while 50% have practiced pulping using steel pulpers. About 67% use the all-weather elevated dryers and 33% have used the MCSTD. According to the farmers, the MCSTD dries coffee faster (parchment for 4-5 days and 7-8 for dried berries) than sundrying. Drying in pavement is discouraged because it renders poor quality coffee beans and prone to molds and contamination which may affect the aroma and taste of coffee.

After the project, all of the farmers (100%) use moisture meter in determining dryness of their coffee. The use of moisture meter in determining moisture content (MC) of coffee serve as a very important tool for farmers in knowing the right moisture content of their coffee and provides them additional bargaining powers for good price of their coffee beans. The required moisture for quality coffee bean is between 11-12 MC. (Idago, 2012). All of CGUMC farmers avail of hulling services of the cooperative. All (100%) farmers properly sort theri coffee beans. Women are hired as paid laborers in the coop. Sorted beans are considered good beans because its free from defective, broken beans and other foreign matters, demanding better price in the market. Sorted beans are used as raw material for roasted coffee.

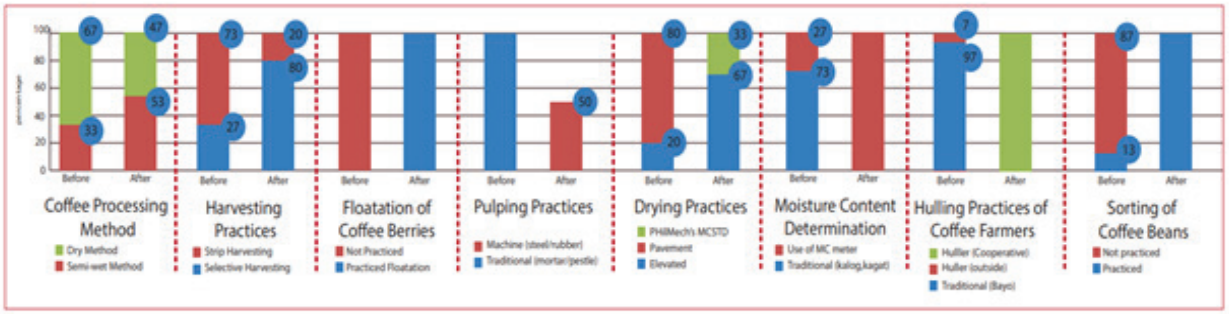

Figure 4. Changes in the postharvest practices of CGUMC farmers before and after the project

Increase in the Number of Farmers of BBOACPGAI Adopting Postharvest Technologies

The changes in the postharvest practices of BBOACPGAI farmers before and after the project is shown in Figure 5. Before the project, all of the farmers (100%) adopted the wet method; of processing Arabica coffee; About 72% practiced selective harvesting while 28% of the farmers practiced stripping method of harvesting. This was mostly done by men. All farmers already practiced floatation, removal of the overiped, empty or defective berries. About 92% of farmers used wooden pulpers. This was done by mostly women. All of the farmers (100%) practiced fermentation of their coffee beans. Sixty percent of farmers used elevated drying of their coffee berries. All of the farmers (100%) practiced biting "kagat" and touch and feel "alog" shaking, in determining dryness of their coffee. About 96% of the farmers used mortar and pestle in hulling their coffee sold as green beans only 12% of the farmers practiced sorting of beans.

After the project, 100% of the farmers still adopt the wet method of processing coffee. Now, 92% of them already practiced selective harvesting (picking only the ripe or mature berries of coffee). This was done by both men and women farmers. All of the farmers (100%) practice floatation to remove empty, overripe and defective beans. About 96% of the farmers practice pulping using PHilMech rubber pulpers.

The use of PHilMech rubber pulpers not only ease the drudgery of pulping coffee but also promotes the production of good quality coffee beans. Women farmers preferred to use the rubber pulpers as compared to the wooden pulpers due to the following reasons: (1) ease of operation; (2) good performance; and (3) easy to carry in the mountain due to its small size.

In terms of drying practice 100% of the farmers used the all-weather elevated dryers. The drastic change in the drying practice contributed to the enhancement of the quality of the coffee of the BBOACPGAI 92% of the farmers used moisture meter in determining dryness of their coffee. About 72% of the farmers use mechanical hullers while some 28% still practice traditional hulling due to problem on distance of coffee farms to the center. About 87% of the farmers practice sorting and a few still sell their coffee in the form of coffee parchment, hence they no longer practice sorting.

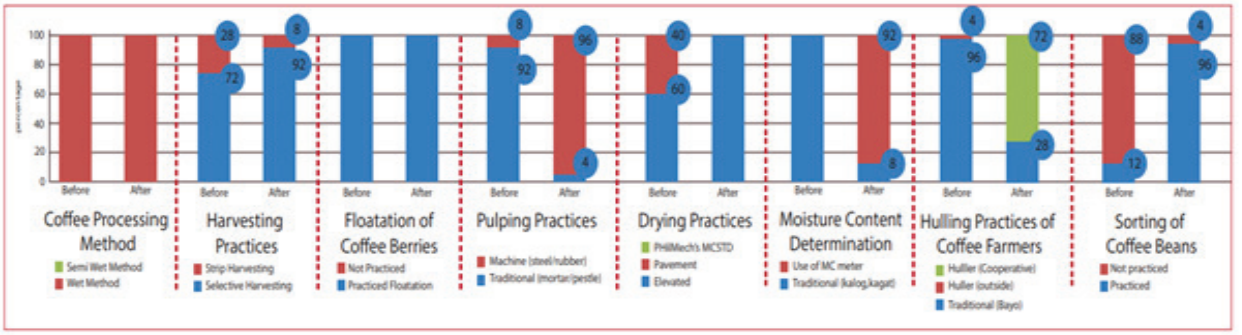

Figure 5. Changes in the postharvest practices of BBOACPGAI farmers before and after the project

Effects on the Adoption of Improved Postharvest Technologies/System to Farmers Income

Partial Budget Analysis of selective harvesting of coffee + use of All Weather Dryer versus traditional practice of harvesting by stripping + drying using concrete pavement, of CGUMC farmers in Cabuyao, Laguna

The CGUMC farmers adopting the recommended postharvest practice of dry or natural method of processing Robusta coffee gained an **incremental change in income of P14, 538.89 (Table 1)**. Partial budget analysis revealed positive financial advantage of selective harvesting and the use of all-weather dryer over the traditional practice of stripping method of harvesting (which includes the ripe and unripe berries) and drying the berries in multipurpose drying pavement.

The positive effects leading to the increase in income are the added returns due to the improvement in the quality of coffee beans resulting to a higher selling price to the market. There is, however, an added cost on labor because the harvesting became more tedious when farmers adopt the selective process and added investment for the installation of an all-weather dryer. This practice is common to coffee farmers of CGUMC, Cabuyao, Laguna adopting dry method of coffee processing.

Table 1. Partial budget analysis of selective harvesting of coffee + use of all-weather Dryer (AWD) versus harvesting by stripping + drying of berries on pavement

TOTAL GAINS	**TOTAL LOSSES**
Added Return • Gross income from P 16, 100.00 additional incentives in good quality coffee Reduced Cost • Labor cost on harvesting P 4, 800.00 Subtotal P 20, 900.00	Added Cost • Annual depreciation for P 1, 500.00 AWD • Labor cost on P 4, 861.11 harvesting Reduced Return Subtotal P 6, 361.11
Estimated incremental change in income (A-B) = P 14, 538.89	
• Average yield of fresh berries per hectare: 3500 kg; • Average yield of GCB per hectare: 700 kg; • Labor cost for harvesting: Php 250 per day; • Labor cost for drying: Php 150 per day; • Price for properly dried and good quality coffee: P138.00/kg.; • Price for poor quality coffee: P115.00; • Drying time on pavement: 16 days @ 16 batches;	• Drying time using AWD: 14 days @ 16 batches; • Number of harvesters per hectare: 3 pax; • Average kilograms of 1 laborer when strip harvesting: 60 kgs/day; • Average kilograms of 1 laborer when priming: 30 kgs/day; • Investment cost of AWD: P 7, 500.00; • Life span: 5 years; Depreciation = P 7,500.00/ 5 years

Partial budget analysis of selective harvesting of coffee + use of steel pulper + use of All Weather Dryer versus traditional practice of harvesting by stripping + drying using multi-purpose drying pavement, of CGUMC farmers in Cabuyao, Laguna

The CGUMC farmers adopting the recommended postharvest practice of semi-wet method of processing Robusta coffee gained an **incremental increase in income of Php31, 888.89 (Table 2)** which covers the following activities: selective harvesting of berries, use of steel pulper and drying using AWD compared to the farmers' traditional practice of harvest by stripping plus drying using the multi-purpose drying pavement. The positive effects leading to the increase in income were the added returns due to the improvement in the quality of coffee beans resulting to a higher selling price in the market and reduction of labor cost in drying. Moreover, drying duration was shorter for drying of coffee parchment. There is, however, an added cost on labor on harvesting and pulping activities plus additional costs on depreciation of steel pulper and All Weather Dryer. This confirmed earlier studies of PHilMech that the adoption of the recommended technologies resulted to reduced percentage of broken beans and improved quality of green beans from below standard coffee grade class 4 to premium coffee, class 2, (de la Cruz, 2014)

Table 2. Partial budget analysis of selective harvesting of coffee beans + pulping + drying using AWD versus harvesting by stripping + drying using pavement

TOTAL GAINS	TOTAL LOSSES
Added Return • Gross income from P 16, 100.00 additional incentives in good quality coffee	Added Cost • Annual depreciation for P 1, 500.00 AWD • Annual depreciation for P 2,250.00 steel pulper • Labor cost on P 4, 861.11 harvesting • Labor cost for pulping P 3,500.00
Reduced Cost • Labor cost on drying P 27,900.00	Reduced Return
Subtotal P 44.000.00	Subtotal P 12,111.11
Estimated incremental change in income (A-B) = P 31, 888.89	
• Average yield of fresh berries per hectare: 3500 kg; • Average yield of GCB per hectare: 700 kg; • Labor cost for harvesting: Php 250 per day; • Labor cost for drying: Php 150 per day; • Price for properly dried and good quality coffee: P138.00; • Price for poor quality coffee: P115.00; • Drying time of fresh berries on pavement: 16 days @ 16 batches; • Drying time of wet parchment using AWD: 10 days @ 7 batches;	• Number of harvester per hectare: 3 pax • Average kilograms of 1 laborer when strip harvesting: 60 kgs/day; • Average kilograms of 1 laborer when priming: 30 kgs/day; • Investment cost of AWD: P 7, 500.00; Life span: 5 years; • Depreciation = P 7,500.00/5 years; • Investment cost of steel pulper: P 25, 000.00; • Life span: 10 years; Salvage value steel pulper = 10%

Partial budget analysis of selective harvesting + use of rubber pulper + all weather dryer versus selective harvesting + use of wooden pulpers + sundrying of coffee of BBOACPGAI, farmers in Bokod, Benguet

Farmers gained an **incremental increase in income of P7, 130.00 per ha (Table 3)** for adopting the recommended postharvest practices/technologies for Arabica coffee. These include the following activities: selective harvesting of coffee berries including the use of PHilMech pulper and All Weather Dryer (AWD) for coffee drying. Compared to selective harvesting plus use of wooden pulpers and sundrying of coffee. The increase in income was due to the reduction of labor costs on drying coffee parchment and appreciation in the value of coffee beans because of good quality resulting to higher price. There is however, an added cost of P3,470 on depreciation of rubber pulper , All-weather dryer, as well as labor costs for pulping coffee. There is, however, an added cost on labor on harvesting and pulping and additional costs on depreciation of steel pulper and All weather Dryer. This practice was done by majority of BBOACPGAI farmers in Bokod, Benguet.

Table 3. Partial budget analysis for selective harvesting + use of rubber pulper + all weather dryer versus selective harvesting + use of wooden pulpers + sundrying of coffee

TOTAL GAINS	TOTAL LOSSES
Added Return • Gross income from P 9, 100.00 additional incentives in good quality coffee	Added Cost • Annual depreciation for P 1, 500.00 AWD • Annual depreciation for rubber pulper P 720.00 • Labor cost on P 4, 861.11 harvesting • Labor cost for pulping P 1,250.00
Reduced Cost • Labor cost on drying P 1,600.00	Reduced Return
Subtotal P 10,600.00	Subtotal P 3,470.00
Estimated incremental change in income (A-B) = P 7, 130.00	
• Average yield of fresh berries per hectare: 1500 kg; • Average yield of GCB per hectare: 300 kg; • Labor cost for drying: Php 200 per day; • Labor cost for pulping: Php 250 per day; • Price for properly dried and good quality coffee: P250.00; Price for poor quality coffee: P220.00;	• Drying time of wet parchment on pavement: 9 days @ 4 batches; • Drying time of wet parchment using AWD: 7 days @ 4 batches; • Investment cost of AWD: P 7, 500.00; • Life span: 5 years; • Depreciation = P 7,500.00/5 years

Effects on Adoption of Improved Postharvest Technologies/System to the Income of the Farmers' Cooperative/Organization

Increase in Income of the Casile-Guinting Upland Marketing Cooperative

a. Income statement of CGUMC for the period 2016-2018

Table 4 shows the income statement based on the actual operation of CGUMC for the period 2016-2018. The CGUMC earned a net income of **Php149,898.00, Php81,563.00 and Php710, 872.00** respectively for the three year period. The significant increase in income in 2018 was attributed to: (1) increase in sales of roasted coffee (total sales of 9,575 packs of 250g roasted coffee sold at Php150.00/pack); (2) enhanced participation of the farmers hence increase in the volume of coffee berries processed in the cooperative; and (3) improvement in the quality of raw materials sold by farmers to the cooperative, giving the opportunity to sell roasted coffee at a higher price. The breakeven volume is 1,825 packs of 250g roasted coffee and the breakeven price is at Php75.76 per pack.

Table 4. Income statement of the Casile-Guinting Upland Marketing Cooperative's (CGUMC) for the period 2016-2018.

	2016	2017	2018
Sales – Roasted coffee	622,641.00	576,072.00	1,436,250.00
Total sales	**622,641.00**	**576,072.00**	**1,436,250.00**
Less: Operating costs			
Variable costs			
Raw berries	256,334.00	227,037.00	301,957.00
Packaging and Label			87,254.00
Delivery		7,500.00	11,425.00
Operating expenses	49,009.00	16,251.00	34,106.00
Miscellaneous		9,071.00	5,430.00
Salaries and wages		67,250.00	117,806.00
Fixed costs			
Depreciation expense	167,400.00	167,400.00	167,400.00
Total operating costs	**472,743.00**	**494,509.00**	**725,378.00**
Net Income	**149,898.00**	**81,563.00**	**710,872.00**

b. Financial Analyses of CGUMC

Results of the financial analysis revealed that the enterprise is profitable. The initial investments can be recovered in four years. The net present value is Php2,149,410.31, internal rate of return of 32%; benefit cost ratio of 1.43; and return on investment of 23.33%. This is reflective of the current scenario where the government lends the coffee equipment and facilities such as dryer (multi-commodity solar tunnel dryer, huller, roaster, grinder, processing building) to the CGUMC free of charge. The CGUMC on the other hand, provided counterpart funds of Php200,000.00, for the building and Php2,000,000.00 for the land with a beginning cash capital.

Increase in Income of the BBOACGPAI

a. Income statement of BBOACPGAI the period 2017-2018

Table 5 shows the income statement based on the actual operation of BBOACPGAI for the period 2016-2018. The BBOACPGAI sales were categorized into sales of roasted coffee and dried parchment with the latter comprising 78% of their total sales. Positive net income was only attained in 2017 and 2018 amounting to P44,986.00, and P69,122.00 pesos respectively. While the BBOACPGAI earned a positive income it can be deduced that the group have not yet fully attained maximum production of roasted coffee since bulk of their sales were on dried parchment. Hulling and roasting services were done outside the cooperative which add up to their variable cost due to the inefficient installed coffee huller and roaster. For the breakeven analysis, BBOACPGAI needs to sell 953 packs of roasted coffee to cover the fixed expenses (depreciation) of P79, 735.00 with a breakeven price of P225.58 per 250 gram pack of roasted coffee.

Table 5. Income statement based on Bobok-Bisal Organic Arabica Coffee Producers and Growers Association Inc. (BBOACPGAI) actual operation for the period 2016 -2018

	2016	2017	2018
Sales – Roasted coffee	27,600.00	94,350.00	152,000.00
Sales – Roasted coffee	92,160.00	729,070.00	703,660.00
Total sales	**119,760.00**	**823,420.00**	**855,660.00**
Less: Operating costs			
Variable costs			
Raw materials	99,737.00	677,165.00	689,422.00
Hulling Service Fee	-	3,168.00	2,316.00
Roasting Service Fee	-	7,868.00	9,115.00
Packaging	-	3,453.00	3,929.00
Other Expenses	23,261.00	300.00	661.00
Labor cost	5,552.00	1,545.00	-
Fixed expenses			
Depreciation expense	79,735.00	79,735.00	79,735.00
Total operating costs	**212,645.00**	**778,434.00**	**786,538.00**
Net Income	**(92,885.00)**	**44,986.00**	**69,122.00**

b. Financial Analyses of BBOACPGAI

Financial analysis revealed that the enterprise is profitable. The investments can be recovered in 6.51 years, with a net present value of Php107, 989.04; IRR of 17%; BCR of 1.03; and ROI of 7.07%. This is reflective of the current scenario where the government lends the coffee equipment and facilities such as huller, moisture meter, roaster, grinder and processing building to the BBOACPGAI free of charge. The cost of the processing center/ building was not yet included in the computations because the building was only turned-over and occupied by the farmers in March 2019. On the other hand, the BBOACPGAI provided counterpart funds of Php720,000.00 comprising of all-weather dryers, land and operating capital.

Socio - Economic Benefits on the Adoption of the Recommended Postharvest Technologies

Improvement in the Quality of Coffee Beans

Improvement in the quality of coffee beans was attained by CGUMC and BBOACPGAI as a result of their adoption of the developed postharvest practices/technologies. This was evident when farmers submitted samples of their coffee beans for Cupping Quality Assessment. In March 2017, the CGUMC joined the Kape Filipino Green Bean Quality Competition organized by the Philippine Coffee Board Inc. in Cavite State University (CAVSU).The coffee samples submitted by Mr. Arnel Bernard Gonzales, a farmer and former board member of the Casile-Guinting Upland Marketing Cooperative garnered a total score of 82.08, and ranked 8th from the 78 coffee samples who joined the competition.

On the other hand, the Bobok-Bisal Organic Arabica Coffee Producers and Growers Association Incorporated (BBOACPGAI garnered a total score of 84.83 during the Coffee Cupping Quality Assessment sponsored by DA-RFO, CAR last October 8, 2018 at Hotel Supreme, Baguio City.

The coffee cupping quality assessment is one of way of knowing the quality of farmer's coffee. Cupping is the practice of observing the tastes and aromas of brewed coffee. It is used by cuppers to evaluate coffee aroma and the flavor profile of a coffee. A Q grader is a person certified by Coffee Quality Institute (CQI) qualified to evaluate and measure quality of coffee through smell and taste. The Total Score Quality Classification is defined according to the scores given to the coffee sample. Scores of 80 and above is considered specialty coffee. The score of 90-100 is considered Outstanding Specialty; 85-89.99 Excellent; 80-84.99 Very good; <80 Not Specialty (source: http:www.perfectdailygrind.com/2017/05/q-grader-program/)

Adding Value to Coffee and Branding of Locally Produced Roasted Coffee

The CGUMC and BBOACPGAI gained added income through roasting and grinding of coffee. Among the benefits derived in roastiing and grinding coffee were: (1) increased income of the cooperative.; (2) enhanced technology adoption; (3) encouraged farmers to produce quality coffee beans; (4) boosted farmers confidence to market their own brand of coffee; (5) generates employment opportunities of farmer members; and (6) promotes sustainable business and inclusive growth. On the other hand, COINDECO farmers gained price incentives in selling sorted green coffee beans.

Both The CGUMC and BBOACPGAI were able to develop its own brand "Café de Cabuyao" and "Bobok Aroma" as part of their value-adding and marketing strategies. Branding is one way of attracting customers and encourage farmers to sustain the production of quality roasted coffee. The CGUMC and BBOACPGAI learned proper packaging and labelling of their coffee products with the assistance of the Departmentn of Trade and Industry, (DTI) in their areas.

Generated Employment Opportunities to Men and Women Members of the Cooperative

The BBOACPGAI, and CGUMC, generated employment opportunities for their own members. The CGUMC and BBOACPGAI employed plant managers as regular paid employees with a daily salary of Php400 and Php250 respectively. Aside from personnel to manage their business, the CGMUC also hires four laborers mostly women to do drying of coffee berries/parchment, sorting of beans, packaging and labeling of coffee in packs before it's delivered to their customers. At present, CGUMC paid their laborers at Php200-250/day; machine operators at Php350/ day on call basis. The BBOACPGAI hires women as on-call workers to do tedious job like sorting and packaging of coffee.

Expansion of Market of Quality Coffee Beans and Quality Roasted Coffee

The adoption of improve postharvest technologies/system boosted confidence for CGUMC and BBOACPGAI to expand market of roasted coffee. The CGUMC maintains their

customer base i.e. LGU Cabuyao, and regular market outlets like the pasalubong centers in Cabuyao, Laguna and Tagaytay. They also used their processing center as display and marketing channels of their coffee. The group planned to sell ready to drink (brewed coffee) to walk-in customers plying the Casile-Tagaytay route to increase sales of their coffee. The BBOACPGAI farmers plans to undertake aggressive promotion of their through social media and convince the LGU to patronize their coffee to increase sales. COINDECO was able to tap niche market of quality green coffee beans in Manila at the price acceptable to the farmers.

Effect of Partnership and Convergence of Partner Agencies

Harmonization of Existing Efforts of Government Agencies of DA-RFO, LGUs, DTI and PHilMech

The project was able to harmonize existing efforts of government agencies particularly the DA-RFO CAR and DA-RFO IV-A together with their partner LGUs (Bokod,La Trinidad Benguet and LGU Cabuyao, Laguna, in the project site. The DA-RFO HVCDP Regional Focal Person committed to allocate counterpart funds on a yearly basis to complement targeted activities of PHilMech (i.e. learning sessions on improving technical, business management, market matching and product exposition). On the other hand, the concerned Local Government Units (LGUs) through the Municipal Agriculture Office (MAOs) and the Municipal Mayors of Cabuyao Laguna, and Bokod, Benguet provided necessary technical assistance/ feedback of farmers processing activities. The summary of technological and financial assistance provided are listed below:

Level	Name of Agency/Organization	Type of Support Provided (Equipment, Financial and other Resources)
National	DA- BAR DA – HVCDP National PHilMech	• Funding Support of P 4.0 M for 4 years project duration/implementation • Spearhead the implementation of the project in selected coffee cooperators nationwide. Coach and mentor farmer cooperators and project partners in four targeted sites nationwide
	DA- RFO HVCDP, Cordillera	• Provision of postharvest and processing equipment processing building amounting to Php2.0 M pesos to the farmer cooperators
	Administrative Region (CAR) Baguio City	• Co-organizer and Host of National Annual Project Assessment and Coffee Exposition and Cost-with PHilMech in the conduct of learning activities/on site
Regional	DA- RFO 4- A, Visayas Avenue Quezon City	• Provision of funds for the construction of the processing building P 1.0 M pesos
	DA- RFO 6, Ilo-ilo City	• Co-organizer and Host of National Annual Project Assessment and Coffee Exposition and cost-share with PHilMech in the conduct of activities on site
	DA- RFO 12, Koronadal South Cotabato	

Provincial	LGU Negros Occidental	• Ensure the smooth implementation of targeted activities in the project sites. Cost-share in the conduct of trainings, meetings, workshops on project site
	LGU Bokod, Benguet	
Municipal	LGU Kalamansig, Sultan Kudarat	

Enhanced Knowledge and Skills on Improved Postharvest Technologies/System for Coffee

The active involvement of the project team composed of representatives from the Regional HVCDP Focal Persons and staff of DA-RFO and LGU staff in participatory planning, implementation monitoring and evaluation of project activities enhanced their knowledge and skills and made them effective change agents/enablers in their area. The project was able to recognize their contribution as co-implementers and co- owners of the project's output and outcome.

Benefits of Cross Cuting Activities

Conduct of Coffee Exposition Promotes Wider Adoption of Recommended Postharvest Practices/Technologies and Provides Venue for Sharing of Experiences, Information and Best Practices

The project regularly organizes an Annual National Project Assessment to assess the targeted CBCPEs progress and accomplishments as well as improvements in the quality of coffee processed by the farmers. To make the activity look festive and exciting for the farmers, the project together with its project partners agreed to conduct an Annual Coffee Exposition as a side event. Starting in 2015, the project was able to conduct a total of four national coffee expositions and became a yearly event attended by more than 200 participants, composed of representatives from DA-RFOs, LGUs, coffee farmers, coffee enthusiasts and the private sector coming from the five participating regions (DA-RFO CAR, 4-A, 6, 12 and CARAGA) and selected Local Government Units.

During the Coffee Expo, the farmers were encouraged to bring their coffee in a form of green beans or roasted coffee for sale and/or promotional purposes (free tasting). Coffee roasters and owners of coffee shops in the locality were also invited for market matching and market information. Other activities done were (1) coffee cupping quality assessment, (2) technical sessions, (3) coffee profiling, (4) sales pitching, (5) basics of manual brewing, (6) coffee tasting, (7) market matching and linkage (8) product display, (9) equipment demo. The Coffee Exposition provides venue for sharing of ideas/information, best practices between and among the participants. The activity coincided with the Annual Project Assessment hosted and co-funded by the participating DA-RFOs.

Cross Visits to Successful CBCPEs acting as Learning Sites/Social Laboratories

So far, a total of 10 batches of training courses and demonstration were conducted/ organized in collaboration with the CGUMC to showcase the adoption of postharvest system integrated in the processing of Robusta coffee. The cooperative became a regular venue used not only by PhilMech but also by the Department of Agriculture and the local government of Cabuyao. Visitors of other areas like coffee farmers and development workers were brought to the successful CBCPEs like the CGUMC for coffee Robusta and BBOACPGAI for coffee Arabica either for training and benchmarking purposes.

Development of Knowledge Products in Collaboration with Internal and External Partners

The project also collaborated with other units internal and external to produce knowledge products in order to disseminate information and encourage multiplier effect in technology adoption. Some of the knowledge products developed were: (1) instructional video on postharvest system for Coffee Arabica and Robusta and success story video of a farmer- adopter produced by DA-RFO CARAGA; (2) Poster of PH System for Arabica and Robusta integrated to the operation of the CBCPE; (3) PowerPoint presentation and activity modules on how to build viable coffee enterprises. These knowledge products are now used during the conduct of promotional activities to address increasing interests/ requests for technical assistance on how to build viable community-based coffee processing enterprises. Copies of the video are available at PHilMech and can be accessed anytime.

Problems Encountered and Coping Mechanisms

The CGUMC encountered minor problems and the cooperative were able to set up their coping mechanisms. The most common problem is the presence of market of poor quality beans. This practice discouraged farmers to process and sell properly processed coffee beans. To address the problem, the business manager together with other officers of CGUMC, agreed to conduct visitation and dialogue to the concerned farmer offer incentives for good quality beans to encourage farmer members to adopt new technologies and practices.

In the case of BBOACPGAI, delayed turn-over of coffee processing building to the farmers caused inconvenience to the business management team hence, the low volume of production and low utilization of installed coffee equipment. PHilMech has initiated meetings with DA-RFO CAR, HVCDP regional focal and LGU Bokod to resolve issues with building contractor. The processing building was finally turned over to the BBOACPGAI on March 2019.

CONCLUSION

After four years, the project was able to establish business models tailor-fitted to the farmers' capacity to manage a community based coffee processing enterprise. These are: (1) CBCPE model on production of roasted Robusta coffee (CGUMC); and (2) CBCPE model on production of roasted Arabica coffee and dried parchment (BBOACPGAI). These models successfully integrated the developed postharvest technologies/system.

In this span of time a total of 119 coffee farmers were able to produce quality coffee with added income benefits. Farmers adopting the recommended practices for Arabica coffee gained an incremental change in income of P7,133.33 per hectare. For Robusta farmers, an incremental change in income of P14,538.89 and P31,888.89 per hectare for dry and semi-wet method were gained.

The CGUMC CBCPE business model is profitable. The investments can be recovered in 4.07 years with a net present value Php2,149,410.31, IRR of 32%, BCR of 1.44, and ROI of 40.34%. The breakeven volume is 1,825 packs and the breakeven price is at Php75.76 per pack of roasted coffee.

Likewise, the BBOACPGAI CBCPE business model is also profitable. The investments can be recovered in 6.51 years with a net present value off Php107,989.04, IRR of 17%, BCRs of 1.03, and ROI of 7.07%. The breakeven volume is 953 packs and the breakeven price is at P225.58 per pack of roasted coffee.

In terms of socio-economic benefits, the adoption of recommended postharvest technologies improved: (1) the quality of green coffee beans, (2) allowed the CGUMC and BBOACPGAI to add value to their coffee and established a local brand of roasted coffee (Café de Cabuyao and Bobok Aroma), (3) generated employment opportunities especially to women members of their cooperative doing drying, sorting, packaging and labeling tasks, and (4) expansion of market for quality GCB and roasted coffee.

The project was able to harmonize existing efforts of government agencies through effective partnership and convergence of concerned DA-RFOs and local government units. Partner agencies were able to allocate counterpart funds which contributed to the successful implementation of the project. The project's cross cutting activities such as coffee expositions, cross visits, and development of knowledge products contributed to the continuous dissemination of relevant information and triggered the multiplier effect in technology adoption.

RECOMMENDATION

There is a need to disseminate the successful impact of the project of the two CBCPEs in order to promote the adoption of recommended postharvest technologies for coffee and enhance/maximize its utilization. PHilMech must continue to establish viable community based coffee processing enterprise models in other coffee growing regions following the modalities, approaches, and strategies adopted in the project.

Successful experience of the viable business models should be developed into investment packages to serve as manual to other investors. Building viable business models on Community-Based Coffee Processing Enterprises (CBCPES) in coffee growing communities is the first step towards attaining inclusive growth of farmer-led coffee processing business.

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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.

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