An Exploratory Study of the Economic Potential of Philippine Pili Pulp Oil From Waste Pulp

Salvador P. Catelo¹ and Carolyn D. Jimenez²

Abstract

This paper aims to determine the status of the pili nut and pili pulp oil industry in the Philippines and the competitiveness of processing oil from pili (Canarium ovatum) waste pulp using the domestic resource cost approach. Results of analysis reveal that producing locally one kg of pili pulp oil costs PhP 599. This is almost half the cost of importing olive oil - a close substitute - from Spain estimated at PhP 1,310/kg. In terms of domestic resource cost, there exists comparative (economic) advantage in pili pulp oil production. With a domestic resource cost (DRC) of 0.72, pili pulp oil production in the Philippines is competitive and hence manifests considerable economic potential. It has both employment and income effects that any similar program on inclusive growth aims to generate. If all the pili pulp were processed and converted into pili pulp oil, a total of 262,000 metric tons worth about PhP 212 million could have been generated in 2014.

Keywords: Canarium ovatum, cost and returns, domestic resource cost, import competitiveness, Philippines

Introduction

The natural ingredients industry has been gaining popularity due to the growing consumer awareness regarding health benefits associated with natural essential oils. These natural ingredients are primarily comprised of plant, animal, mineral or microbial ingredients present in or produced by nature (Natural Ingredients Research Center n.d.). They are used directly by end-product manufacturers or as raw material for processing secondary ingredients (Arroyo et al. 2010). The rising demand for natural ingredients in medical and pharmaceutical applications coupled with the increasing demand for natural essential oil as aroma and flavors in food and beverages can be expected to drive faster the demand for natural ingredients in the Philippines and other countries. It is also expected that the increasing interest of consumers in natural personal care boosted by a strong economic growth in emerging markets in Asia will continue to propel natural personal care product sales (Beerling 2013, Ferrara 2013).

Among the most widely used natural ingredients are the natural essential oils. Essential oils are naturally-occurring chemicals that can be derived from leaves, flowers, seeds, fruits, waste pulps, roots or barks. The extracted oil from natural ingredients are now well-recognized for their functional value in pharmaceutical, nutraceutical, cosmetics and personal care products (Catelo 2013). They are being used nowadays as main ingredients in soaps, detergents, as well as cosmetics and perfumes. They are also utilized as aroma and flavor enhancers to a wide variety of food and beverages and as key ingredients in many massage oil and ointments. In 2014, both food and beverages and spa and relaxation dominated the global market for natural essential oil. Of the total volume traded, the former accounts for around 30% while the latter comprises around 29%. Spa and relaxation owes its share to the rising popularity of aromatherapy and other procedures (Grand View Research, Inc. 2015).

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Several countries import large quantities of natural ingredients to meet their demand for use in soaps, detergents, perfumes and other household goods (New Agriculturist, n.d.). Observatory of Economic Complexity (2013) cited that the top importers are the United States (US$ 739 million), France (US$ 321 million), China (US$ 303 million), the United Kingdom (US$ 270 million) and Germany (US$ 253 million). Meanwhile, Grand View Research, Inc. (2015) estimated that global essential oil market size was at US$ 5.51 billion in 2014. The agency also cited that the global essential oil market is expected to reach US$ 11.67 billion by 2022.

With the rise in the global demand, there is an opportunity for the Philippines to venture in natural essential oil production. One of potential sources is the pili pulp oil that can be extracted from pili pulp waste. It should be pointed out that while the Philippines dominates the world export market for pili (Canarium ovatum) products (Gallegos et al. 2013), it has likewise produced pili pulp that is usually discarded as waste (Pham and Dumandan 2015).

The records of the Department of Agriculture show that the Philippines has been exporting elemi resin to the USA, Great Britain, France, Germany, Italy, the Netherlands, Cuba, China, Hong Kong and Japan. The elemi gives out an essential oil called limonene, which is used in the manufacture of perfumes because of its lasting aroma that blends well with lavender, rosemary, frankincense, sage, myrrh, patchouli, vetiver and other international fragrances (DENR 2015). The Philippines, has an inherent capacity to trade pili on a global scale having been listed by the International Federation of Essential Oils and Aroma Trades as the sole source of the Manila elemi resin that is shipped out in raw form (Philippine News Agency 2015).

In recent years, the Department of Agriculture identified pili as a crop worthy of more intensive research and development activities (Gallegos et al. 2013). Opportunities exist for the development of pili as a major crop export that would compete well in the global world market. For one, pili has the potential of being a top export commodity that is comparable with macadamia, cashew, almond and walnut in terms of quality. Because of this, various development programs were implemented to assist the Bicol region, particularly Albay, in the production and processing of pili nuts, pili resin and other products (Guiam 2010). However, what is yet untapped is the mass utilization of the discarded pili pulp and its commercialization into pili pulp oil. Central to its realization is the answer to the issue of competitiveness which this paper aims to address.

**Objectives of the Study**

This paper aims to explore the economic potential of processing oil from pili pulp waste particularly in the Bicol Region. Specifically, the study: 1) examines the status of the pili nut and pili pulp oil industry in the Philippines and 2) determines the competitiveness of the pili pulp oil vis-à-vis the imported olive oil.

**Methodology**

**Data Collection**

Primary data on pili nut production and pili pulp oil processing were collected through face-to-face interviews using pre-tested questionnaire. Thirty (30) pili nut processors were interviewed in Albay and the selection of respondents solely relied on referrals by the limited number of pili nut processors in the province.

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3 Elemi resin is extracted from the pili tree. This product is normally subjected to steam distillation to produce essential oil. It has a fresh woody, lemon-like odor that lifts the spirits and creates a festive environment (Bovenizer n.d.).
Secondary data on pili and other pili products were also collected from the various agencies including the Department of Agriculture-Regional Field Office 5 (DA-RFO 5), Department of Environment and Natural Resources (DENR), Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and Philippine Statistics Authority (PSA).

The computations of import parity price and domestic resource cost were based on the data gathered from the Bureau of Customs (BOC), essential oil manufacturers and olive oil exporters in the country.

**Analytical Tool**

To analyze the competitiveness of locally produced pili pulp oil, the import parity price and domestic resource cost (DRC) were estimated. Import competitiveness was analyzed through the ratio:

\[
\frac{\text{Import Party Price}}{\text{Domestic Wholesale Price}} > 1
\]

where,

- **Import parity price** = import price (PhP/unit) + Duties and Taxes (PhP/unit) + Port costs (PhP/unit) + transport cost (PhP/unit) until the imported oil reached the Manila oil processor

- **Import price (at Manila South Harbor port, PhP/unit)** = CIF price (Manila South Harbor port, US$/unit) x foreign exchange rate (PhP/US$)

- **CIF price (Manila South Harbor port, US$/unit)** = World price (FOB Spain, US$/unit) + ocean freight and insurance (US$/unit)

- **Total Duties and Taxes** = Customs Duty + VAT + IPF + Excise Tax (if applicable)

- **Customs Duty** = Customs Value (Dutiable Value) x foreign exchange rate x rate of duty

- **Dutiable Value** = Cost of Goods + Freight + Insurance + Other Charges and Costs

- **Exchange Rate** = As published weekly through Customs Memorandum Circular

- **Rate of Duty** = As per classification of goods under AHTN, Section 104, TCCP

- **VAT** = 12% of Total Landed Cost (TLC)

- **TLC** = dutiable value + bank charges + customs duty + brokerage fee + arrastre charge + customs documentary stamp (CDS) + import processing fee (IPF)

- **CDS** = Fixed amount of PhP 265.00

- **IPF table**

<table>
<thead>
<tr>
<th>Dutiable Value of Shipment</th>
<th>IPF / Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to PhP 250,000</td>
<td>PhP 250.00</td>
</tr>
<tr>
<td>Over PhP 250,000 to PhP 500,000</td>
<td>PhP 500.00</td>
</tr>
<tr>
<td>Over PhP 500,000 to PhP 750,000</td>
<td>PhP 750.00</td>
</tr>
<tr>
<td>Over PhP 750,000</td>
<td>PhP 1,000.00</td>
</tr>
</tbody>
</table>
The domestically produced product (pili pulp oil) is less expensive and henceforth can compete with the imported ones (olive oil) when the computed ratio is greater than 1. Meanwhile if the ratio is less than 1, the imported product is cheaper and the local product cannot compete (Pabuayon et al. 2013).

Briones (2014, p. 5) stated that “the ideal of efficiency implies specialization of an economy in competitive sub-sectors, whilst relying on international markets to satisfy demand from other sub-sectors.” This is the "comparative advantage" interpretation of competitiveness. DRC analysis measures the economic (exclusive of taxes and subsidies) as well as the financial (inclusive of taxes and subsidies) profitability of entire value chains including the individual segments within these chains (Stryker 2009). DRC estimates the country’s efficiency in utilizing the domestic resources in the production of certain goods (USAID 2011, Le Thi Thanh Loan et al. 2016).

In the analysis of the country’s competitiveness in pili oil production, the comparative (economic) advantage is indicated by a DRC of less than 1 (DRC<1). The smaller the DRC, the greater the advantage would be. On the other hand, DRC> 1 indicates the existence of the country’s “comparative (economic) disadvantage”. This implies that the country is not efficiently producing such natural ingredient. DRC can be computed as follows (Ismail et al. 2009):

\[
DRC_{ij} = \frac{C^d_{ij}}{P_{ij} - C^f_{ij}}
\]

where,

- \(C^d_{ij}\) and \(C^f_{ij}\) represent the domestic and foreign input costs, respectively, for country i’s (Philippines) production of good j (pili pulp oil)
- \(P_{ij}\) is the average unit price of country i’s production of good j
- \(C^d_{ij}\) includes non-tradable input costs (e.g., land, labor and capital)
- \(P_{ij} - C^f_{ij}\) is the domestic value added generated by the production process

Results and Discussion

**Overview and Potential of Pili Nut and Pili Pulp Oil Industry in the Philippines**

**Pili Nut Production, Area and Prices**

The Bicol region plays a significant role in the country’s pili industry. The Bureau of Agricultural Statistics (BAS 2015) reports that the region accounts for more than 80% of the total number of pili fruit bearing trees in the Philippines. The bulk supply of raw pili nuts comes from the provinces of Sorsogon and Albay (BAS 2015). Henceforth pili nut production in the Philippines follows the trend of pili nut production in the Bicol Region. Any change in production in the region affects the national production trend (BAS 2015). Pili nut production has been steadily increasing from 2006 to 2014 (Figure 1).

In 2014, Bicol region was the major producer and source of pili nut/kernel accounting for 85% of the national pili production volume. The total regional production in 2014 was 6.18 thousand tons, showing a 13% increase over the 2010 (5.5 thousand tons) figures. It has an existing area of 1,903.97 hectares with 142.34 thousand bearing trees.
Sorsogon recorded the highest production in the entire region and country in 2014 at 4 thousand tons, marking a 17% increase in production from its 2010 performance. Albay ranked second to Sorsogon at 1.74 thousand tons (BAS 2015).

![Figure 1. Pili nut production in the Philippines, 2014](image)

The total area planted to pili in the region was 1,909.97 hectares in 2014, an 8% increase from 2010 (1,762.52 ha). Masbate had the highest increase in terms of area planted to pili (increased by 30%) and production volume (increased by 53%) between 2010 and 2014 (BAS 2015).

Figure 2 shows that, instead of selling the freshly harvested fruits, processing pili and selling pili nut kernel may provide better earnings for the farmer producers and/or processors. In 2014, selling pili nut kernel commands a farmgate price of PhP 256/kg\(^4\) while if sold in fresh or raw form it will only fetch a price of PhP 13/kg.

![Figure 2. Farm gate prices of pili nut products, Philippines, 2011-2014](image)

\(^4\) Exchange rate in 2014 was PhP 44.40/US$. 

Source of basic data: BAS (2015)

Source of basic data: PSA (2015)

Note: No pili kernel price reported in 2007
The Philippine Statistics Authority (PSA 2015) revealed that pili nut production is a promising business venture providing a net return per hectare of PhP 84,233 or a net return - to - cost ratio of PhP 2.49. In other words, a one peso investment in pili fruit production generates a net return of PhP 2.49. PSA also revealed that total yield per hectare was 3,202 kg. Given a farmgate price of PhP 37/kg for fresh pili fruit, this translates to a gross income of PhP 118,058 per hectare. Producing one kg of pili fruit costs about PhP 11.00 or PhP 35,222 per hectare.

Technological Breakthroughs in Pili Processing

Pham and Dumandan(2015) analyzed the chemical and nutritional contents of pili pulp oil. According to the study, pili pulp oil contains unsaponifiable matter which is comprised of carotenoid (Vitamin A), tocopherol (Vitamin E) and sterol (Table 1). These nutrient contents of pili pulp oil make it an excellent ingredient of various cosmeceutical and pharmaceutical products.

Table 1. Percent unsaponifiable matter and its carotenoid, tocopherol and sterol fractions of pili pulp oil, Philippines, 2015

<table>
<thead>
<tr>
<th>Unsaponifiable Matter</th>
<th>Composition, mg/100g oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotenoid (Vitamin A)</td>
<td>141.79</td>
</tr>
<tr>
<td>Tocopherol (Vitamin E)</td>
<td>92.44</td>
</tr>
<tr>
<td>Sterol</td>
<td>1,009.61</td>
</tr>
</tbody>
</table>

Source: Pham and Dumandan (2015)

Known for its unique taste, pili nut kernel is processed into various food items such as glazed crispy pili, pili tart, salted pili and roasted pili (Yee 2016). While pili nut is considered as a high value product, other pili fruit parts are being discarded as waste. In the case of pili fruit pulp, it has the following attributes: 64% of the fruit weight contains 73% moisture and the dry pulp contains 8% protein, 33.6% fat, 3.4% crude fiber, 9.2% ash and 45% carbohydrate (BCARRD 2012).

Pili Pulp Oil, Production Cost, Uses and Employment Potential

This pili pulp might be of limited value in fresh form but it must be noted that this ingredient can be a great source of oil. Figure 3a shows the estimated volume of pili fruit and pili pulp produced from 2000 to 2014. A total of 4.68 thousand metric tons of pili pulp could have been obtained from the pili nut production in 2014.

Figure 3b shows the estimated volume of pili pulp oil that could have been produced by the country from 2000 to 2014. The estimation was made by recognizing that pili pulp is 64% by weight of pili fruit while pili pulp oil is 5.88% by weight of pili pulp (BCARRD 2012). To account for the inefficiency in extraction, a 5% reduction in the yield was assumed. If all the pili pulp were processed and converted into oil, a total of 261.55 thousand metric tons could have been produced and about PhP 211.86\(^3\) million could have been generated in 2014 alone.

\(^3\) Estimated using a wholesale price equal to PhP 810/kg.
Figure 3. Estimated supply of pili pulp and pili pulp oil (in metric tons), Philippines, 2000-2014

Yee (2016) cited that pili pulp oil is suitable for culinary purposes, salad dressing, shortening, canned sardines and other food preparations. It is also used in formulating pharmaceutical and cosmetic products. It has anti-microbial and anti-inflammatory properties, making it effective in healing wounds and allergies. Pili pulp oil is also suitable for people with delicate skin and those who are health conscious because it is organic and contains anti-aging elements that prevent wrinkles, acne and pimples.
Pili pulp oil production requires a small amount of investment since the raw material (pili pulp) is currently considered as waste and is abundantly available in the Bicol region. One way of extracting pili pulp oil is through enzyme-mediated or enzymatic process that uses various equipment such as rotary evaporator and shredder and employs biotechnology (i.e., utilization of enzyme in the form of pectinase) to enhance oil yield.

**Cost of Production of Pili Pulp Oil**

Table 2 shows the cost of producing one kg of pili pulp oil using the enzyme-mediated extraction process. Labor cost from pulp processing to pulp oil accounts for 46% of the entire production cost while depreciation cost represents 48%. The remaining production cost is comprised of extraction materials (4%) and pili pulp (2%). The total cost to produce one kg has been estimated at PhP 599.

**Table 2. Cost of locally producing 1 kg of pili pulp oil, Philippines, 2015**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Price (PhP/unit)</th>
<th>Value (PhP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw material: Pili pulp(^c)</td>
<td>Kg</td>
<td>17</td>
<td>0.53(^6)</td>
<td>9.00</td>
</tr>
<tr>
<td>Labor</td>
<td>man-day</td>
<td>1</td>
<td>275</td>
<td>275</td>
</tr>
<tr>
<td>Extraction materials(^d)</td>
<td>Kg</td>
<td>3</td>
<td>10.20</td>
<td>26.00</td>
</tr>
<tr>
<td>Depreciation cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraction equipment</td>
<td></td>
<td></td>
<td>288.00</td>
<td></td>
</tr>
<tr>
<td>Flexitank (packaging material)</td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td></td>
<td></td>
<td>599</td>
<td></td>
</tr>
</tbody>
</table>

Authors’ calculation

Notes:
\(^{a}\) Computations are based on interview with Espino (2012)
\(^{b}\) Computations are based on survey data (2015)
\(^{c}\) Extraction materials include pectinase (pectic enzyme) and petroleum ether
\(^{d}\) Pili fruits are delivered to the processing site

There is very limited information on the economic impact of pili pulp oil in the Bicol region. However, pili pulp oil processors are very optimistic on its roles in the income and employment generation particularly in the region. The series of training and development programs of the Department of Agriculture - Region V promoting pili pulp oil production boosts the income and employment in the region, particularly in Sorsogon, a major producer of pili nut. According to Yee (2016), pili pulp oil production provides employment and additional source of income to the local people of the community. There are at least eight (8) Women’s Organizations and Farmer Associations operating for pili pulp oil production. These organizations are situated in Bulusan, Sorsogon City, Barcelona, Matnog, Sta. Magdalena, Juban and Irosin. Each organization normally has 30 members who participate in the production of pili pulp oil. These farmer groups usually earn about PhP 280 to PhP 300 per kg of crude pili pulp oil being produced. Among these organizations, Bulusan and Sorsogon City are the two major suppliers producing at least 2,200 kg and 1,650 kg per year, respectively. The remaining groups usually sell at least 110 kg of oil in a year.

\(^6\) There are no existing suppliers of fresh pili pulp in the country. This is primarily because it undergoes fermentation very quickly, thus producing inferior quality oil (Yee 2016). Therefore, the cost of the pulp is estimated based on the labor requirement to depulp the fresh pili drupe. Interview with Yee (2016) revealed that about 0.42 man-days is required to depulp 10,000 pieces (approximately 286 kg) of fresh pili fruit. Depulping will produce 174 kg of pili pulp, the raw material for pili pulp oil production. This is equivalent to an estimated cost of PhP 0.53 per kg of pili pulp.
In the case of one enterprise, additional five laborers were hired when it started producing pili pulp oil in 2000. These laborers have since increased to 12 operators and are each paid PhP 200 per day for pili pulp oil production and processing alone. The enterprise is presently producing 1,000 liters to 5,000 liters of pili pulp oil per month. The wholesale price of pili pulp oil is at PhP719/kg.

**Market for Pili Pulp Oil**

Pili pulp oil, despite its significant chemical and nutritional components, has yet to be fully commercialized (Pham and Dumandan 2015). Pili pulp oil is normally demanded in a small scale as massage oil and as an ingredient in the manufacturing of bath soap, massage oil and anti-dandruff shampoo. Yee (2016) mentioned that pili pulp oil is traded both in the local and in the international markets. Some local retailers and manufacturers are located in Metro Manila and Laguna.

A Filipino who founded the Cosmeceutical Company located in San Diego, California, USA, imports and makes use of pili pulp oil as one of the major ingredients in producing its various cosmetic products. According to Yee (2016), the company is currently purchasing at least 727 kg (or 800 liters) of pili pulp oil annually.

During the interview of the 30 selected local pili processors in 2014, the respondents were given a list of the attributes that are usually considered in buying such raw material. These include nutritive value, health benefits, storage ability, price, assured supply, accessibility, scientific claims and presence of government support and policies. The selected respondents were asked to rank all of these attributes from 1 to 5 based on their importance in their business, with 1 being the most important attribute and 5 as the least important.

The results showed that nutritive value (1.67) is the most important attribute considered for pili pulp (Table 3). This seems to suggest that processors are willing to utilize pili pulp oil only if it contains the nutrients that consumers look for. The attribute of assured supply ranked second with an average rating of 1.87 followed by competitive price and accessibility with average ratings of 2.03 and 2.07, respectively. Judging from the average rating, claims and scientific documentation (3.57) and government support and policies (3.77) do not seem to be of major concern to the processors at the moment.

**Table 3. Attributes considered in processing pili pulp oil, 2014**

<table>
<thead>
<tr>
<th>Item</th>
<th>Average Rating</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritive value</td>
<td>1.67</td>
<td>1</td>
</tr>
<tr>
<td>Assured supply</td>
<td>1.87</td>
<td>2</td>
</tr>
<tr>
<td>Acceptable price</td>
<td>2.03</td>
<td>3</td>
</tr>
<tr>
<td>Accessibility</td>
<td>2.07</td>
<td>4</td>
</tr>
<tr>
<td>Storage ability</td>
<td>2.63</td>
<td>5</td>
</tr>
<tr>
<td>Claims &amp; scientific documentation</td>
<td>3.57</td>
<td>6</td>
</tr>
<tr>
<td>Government support &amp; policies</td>
<td>3.77</td>
<td>7</td>
</tr>
</tbody>
</table>

Source of data: Field survey by the authors (2014)

As a whole, processors would find pili pulp oil processing appealing as it is known for a wide variety of nutritive value and health benefits. Suppliers, however, must assure manufacturersprocessors with consistent supply of the ingredient for their annual operation. This has been the common sentiment of the interviewed pili processors in Albay.
Technical Comparison of Pili Pulp Oil and Imported Olive Oil

Chemical and nutritional analyses performed by DOST - Region V revealed that pili pulp oil is comparable with olive oil (Asuncion 2006). Both oils are being used in massage and aromatherapy treatments. These oils are also effective in preventing wrinkles and acne (Yee 2012 and Lavador 2012). Furthermore, pili pulp oil is more nutritious than olive oil because it contains more fatty acids, beta carotene and carotenoids (Table 4).

Table 4. Physical and chemical properties of pili pulp oil and olive oil, 2006

<table>
<thead>
<tr>
<th>Property</th>
<th>Pili Pulp Oil</th>
<th>Olive Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity (28°C)</td>
<td>0.9546</td>
<td>0.9325</td>
</tr>
<tr>
<td>Refractive index (25°C)</td>
<td>1.4516</td>
<td>1.4368</td>
</tr>
<tr>
<td>Iodine number</td>
<td>68.5 +/-0.2</td>
<td>68.5 +/-0.2</td>
</tr>
<tr>
<td>Saponification</td>
<td>176 +/-2</td>
<td>184 +/-3</td>
</tr>
<tr>
<td>Unsaponifiable matter (%)</td>
<td>1.08 +/-0.01</td>
<td>1.64 +/-0.05</td>
</tr>
<tr>
<td>Free fatty acid (mg/g oil)</td>
<td>4.2 +/-0.4</td>
<td>3.1 +/-0.2</td>
</tr>
<tr>
<td>B-Carotene (mg/100 g sample)</td>
<td>18.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Carotenoids (mg/100g)</td>
<td>42.3</td>
<td>17.8</td>
</tr>
</tbody>
</table>

Source: Asuncion (2006)

According to Pham and Dumandan (2015), the oil yield and unsaponifiable matter contents of pili pulp oil are enhanced using the enzymatic method of extraction and this method provides better oil quality. Pili pulp oil derived from enzymatic oil extraction has higher free fatty acid (+25%), beta carotene (+206%) and carotenoids contents (+235%) contents compared to that of pili pulp oil produced manually.

Import Parity Prices

Table 5 shows the cost of importing olive oil from Spain. This country has been selected as the test case since it one of the major exporting countries of olive oil (Olive Oil Time 2014). In 2011, the country has exported 864 tons of virgin olive oil (FAO 2016). The border price of olive oil in Spain is US$ 17/kg or PhP 744.00/kg at PhP 44.40/ US$. However, importing it would mean additional costs from duties and taxes (PhP 492/kg) when it lands at the Manila South Harbor port plus freight charges and insurance of about PhP 83/kg.

Based on the estimated total costs of locally produced pili pulp oil and imported olive oil, it can be concluded that it is cheaper for local processors and/or manufacturers to use pili pulp oil from Bicol than the imported olive oil from Spain. One kilogram of pili pulp oil from local oil manufacturers/processors costs only PhP 599 (Table 2) compared to importing the same amount of olive oil from Spain that costs PhP 1,310/kg (Table 5). This is an encouraging research finding since aside from the cost consideration, the raw materials are readily available as they are treated as waste with very little value at the moment. Converting them into productive use would mean additional income for pili pulp oil producers and lesser cost of production for local processors that use natural essential oil like pili pulp oil.
### Table 5. Cost of importing 30 kg olive oil from Spain, 2014

<table>
<thead>
<tr>
<th>Item</th>
<th>US Dollar (US$)</th>
<th>Philippine Peso (US$ 1 = PhP 44.40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOB Price</td>
<td>503.02</td>
<td>22,334</td>
</tr>
<tr>
<td>Insurance a</td>
<td>55.33</td>
<td>2,457</td>
</tr>
<tr>
<td>Freight cost b</td>
<td>0.53</td>
<td>23</td>
</tr>
<tr>
<td>CIF Price (Philippine Port)</td>
<td>558.88</td>
<td>24,814</td>
</tr>
<tr>
<td>Duties and taxes c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customs duty</td>
<td></td>
<td>12,407</td>
</tr>
<tr>
<td>Customs documentary stamp</td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>Import processing fee</td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>BIR stamp</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>VAT</td>
<td></td>
<td>1,551</td>
</tr>
<tr>
<td>Subtotal Total</td>
<td></td>
<td>14,473</td>
</tr>
<tr>
<td>Transport Cost d</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Total Cost per 30 kg e</td>
<td></td>
<td>39,309</td>
</tr>
<tr>
<td>Total Cost per kg</td>
<td></td>
<td>1,310</td>
</tr>
</tbody>
</table>

Authors’ calculation
Source of basic data: BOC (2014)

a Insurance is 11% of the good’s value; interview (via e-mail) with olive oil exporters from alibaba.com.
b Freight of a 20-inch container is around US$ 420; maximum gross mass of a 20-foot shipping container for cargo is 24,000 kg according to http://www.shipping-container-housing.com; Freight cost = [30 kg (min import volume) / 24,000 kg (cargo’s capacity)] * US$ 420/kg
c The computation of duties and taxes were based on the formulas given by the Bureau of Customs, regardless of who will shoulder the import duties and taxes:
Customs Duty = CIF Price (Philippine Port, in PhP) x rate of duty; rate of duty for essential oils is 50% based on RA 1937 (Chapter 33)
Fixed fee of PhP 250 for Customs documentary stamp
Fixed import processing fee for goods worth PhP 250,000 and below
Value Added Tax (VAT)= 12% of total landed cost; Total Landed Cost = Customs duty + Customs documentary stamp + Import processing fee + BIR stamp
d From Spain to Manila South Harbor Port; transport cost was assumed to be 10% the FOB price based on interview with an expert
e The figures may change over time. This represents the situation during the period of the study

The result of the import competitiveness analysis of pili pulp oil shows that the ratio of the import parity price to the domestic wholesale price is 1.82 (Table 6). This means that locally produced pili pulp oil can compete with the more expensive imported olive oil. Oil processors may also opt to purchase the locally produced pili pulp oil since the cost of obtaining this ingredient is relatively cheaper.

### Table 6. Import competitiveness of Bicol region’s pili pulp oil, 2016

<table>
<thead>
<tr>
<th>Item</th>
<th>Value (PhP/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Parity Price (A)</td>
<td>1,310</td>
</tr>
<tr>
<td>Domestic Wholesale Price (B)a</td>
<td>719</td>
</tr>
<tr>
<td>A/B</td>
<td>1.82</td>
</tr>
</tbody>
</table>

a Based on interview with Yee (2016)

**Domestic Resource Cost of Producing Pili Pulp Oil**

The domestic resource cost of producing pili pulp oil is 0.72, suggesting the existence of Philippine comparative (economic) advantage in pili pulp oil production. This implies that the country can efficiently produce pili pulp oil (Table 7).
Table 7. Domestic resource cost (DRC) of 1 kg pili pulp oil, 2015

<table>
<thead>
<tr>
<th>Pili Pulp Oil</th>
<th>Value (PhP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Input Costs</td>
<td></td>
</tr>
<tr>
<td>Raw material: Pili pulp</td>
<td>9</td>
</tr>
<tr>
<td>Extraction materials(^a)</td>
<td>26</td>
</tr>
<tr>
<td>Labor</td>
<td>275</td>
</tr>
<tr>
<td>Total</td>
<td>310</td>
</tr>
<tr>
<td>Foreign Input Costs(^b)</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>-</td>
</tr>
<tr>
<td>Extraction equipment</td>
<td>288</td>
</tr>
<tr>
<td>Flexitank (packaging material)</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>289</td>
</tr>
<tr>
<td>Total Costs</td>
<td>599</td>
</tr>
<tr>
<td>Domestic Wholesale Price</td>
<td>719</td>
</tr>
</tbody>
</table>

Source of basic data: Interview with Yee (2016)
\(^a\)Extraction materials include pectinase (pectic enzyme)
\(^b\)Machineries and equipment and packaging materials are all imported.

Conclusion

Pili nut continues to be abundant in the Bicol region. Total regional production in 2014 was 6.18 thousand tons, a 13% increase from the 5.5 thousand tons production in 2010. Pili production is profitable with a net return per hectare of PhP 84,233 or a net return-to-cost ratio of 2.49. Producing one kg of pili fruit costs about PhP 11.00 or PhP 35,222 per hectare.

The locally produced pili pulp oil can compete with the more expensive imported olive oil. The ratio of the import parity price to the domestic wholesale price is 1.82. Producing one kilogram of pili oil costs PhP 599 while importing the same amount of olive oil from Spain costs PhP 1,310/kg. On the other hand, the domestic resource cost of producing pili pulp oil is 0.72, suggesting the existence of Philippine comparative (economic) advantage in pili pulp oil production. This implies that the country can efficiently produce pili pulp oil.

There will be a demand for pili pulp oil if the quality standards set by the processors can be satisfied. The more important attributes are the nutritive value, health benefits and assured supply of pili pulp.

References


Personal Interview with Dr. Teresita Espino (2012), retired professor and scientist of Biotech, UPLB, with expertise in biotechnology and essential oil extraction.