



PHiMech

Quarterly Publication of the Philippine Center for Postharvest Development and Mechanization



COVER STORY

THERE IS MORE IN CACAO PROCESSING

IN THIS ISSUE:

Feature: There is more to Cacao Processing

Feature: Cacao, Chocolates and Other Cacao Trivia

Tech Feature: Briquetting machine



Ms. Karine Claire Castelo models the vaiorus cacao by-products processed and produced by the Bio-Process Engineering Division of PHilMech.

Photo by DMCCapariño

IN THIS ISSUE

Editorial

3 | From cacao wastes to products of use

Feature Story

16 | There Is More to Cacao Processing

18 | Cacao, Chocolates and Other Cacao Trivia

News

4 | Bigger distribution of farm machines eyed

6 | Engineer of PHilMech recognized for excellence

7 | PHilMech wins in the National Invention Contest and Exhibits

8 | Women achievers in Asia recognized in 2020 Summit

9 | Gawad Juana Award for PHilMech engineer

10 | PHilMech to collaborate with SEARCA on Farm Mech

11 | Enhancing the Skills of Rural Women in Soybean Processing

12 | GAD agenda setting, planning and budgeting workshop held

13 | PHilMech joins 7th Uhay Festival

24 | AFACI recognizes PHilMech as outstanding country winner

25 | ACD welcomes a new Chief

Infographics

14 | Products from Cacao Wastes

Technology Feature

19 | Briquetting Machine

Youth (Y4M) Section

22 | Challenge Accepted!

AJPM

23 | Call for Papers!

GAD Section

20 | PHilMech celebrates Women's Month

Inside Beats

26 | Newly appointed auditor of PHilMech

Poster

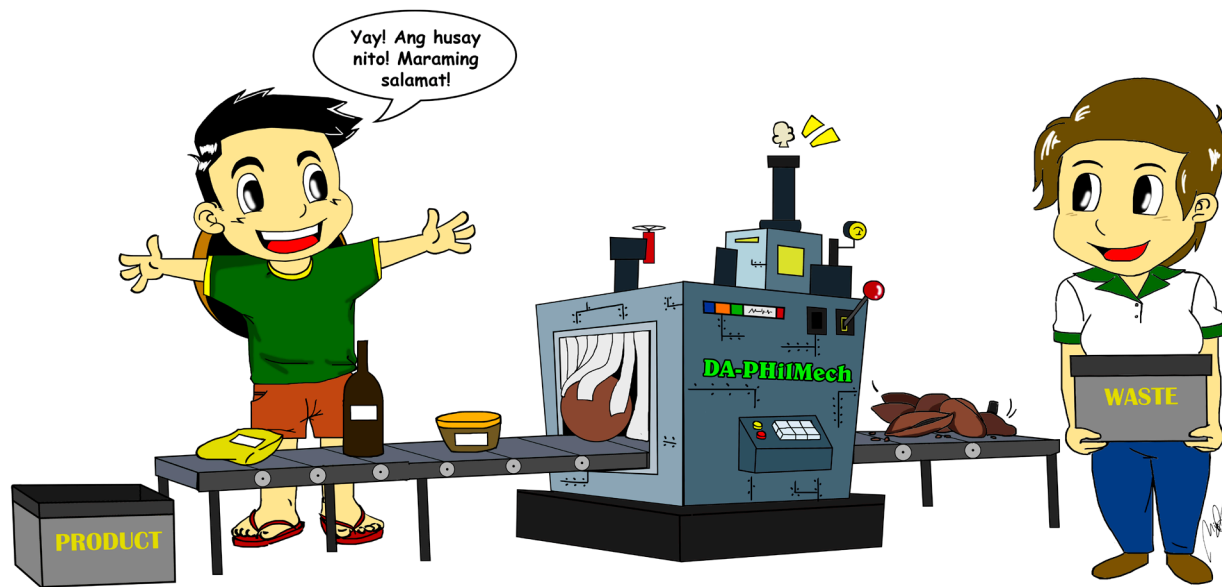
27 | Development of Commercial and Industrial Products from Cacao Sweating

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From cacao wastes to products of use

Low supply of cacao in the market. Low productivity of cacao farmers. Waste disposal problem of cacao pods in the community. These are just some of the problems encountered by the cacao industry stakeholders especially the cacao farmers.

To answer some of the needs in the industry, the Philippine Center for Postharvest Development and Mechanization

(PHilMech), conducted a study on cacao by-products. Yes, cacao is not just for chocolates. Its wastes like the cacao pulp juice and cacao pod husks can be transformed into products of use. With this research result, farmers can now process cacao pulp vinegar, wine, health drink, cacao pod husk briquettes, and so forth.

This processing venture can increase cacao farmers'

productivity. It can also help the waste disposal problem in the community as a result of rotting cacao pods left in the farm. Sounds encouraging?

Hopefully, more farmers will plant cacao, thus increasing cacao production of the country. More farmers will also add value to their produce by processing cacao by-products.



FARM MACHINERY

Sample machinery that will be given to Farmers Cooperative Associations (FCAs) every region

Bigger distribution of farm machines eyed

THE PHILIPPINE CENTER for Postharvest Development and Mechanization sees the P5-billion worth of farm machines to be distributed under the Rice Competitiveness Enhancement Fund (RCEF) Mechanization Component this year as helping the rural economy recover amid the lockdowns and quarantines caused by the coronavirus 2019 (Covid-19) pandemic that started mid-March.

PHilMech will be bidding out within the next four weeks the second batch of farm machines worth P3 billion while the first batch worth P2 billion is currently being distributed nationwide.

PHilMech Executive Director Dr. Baldwin G. Jallorina said the P5-billion worth of farm machines, besides improving primarily rice production, will help stimulate the rural economy as a big part of the

farm equipment to be distributed under the RCEF Mechanization Component are manufactured locally.

Also, the farm machines, including those that would be imported, will be needing maintenance procedures that will help generate additional livelihood in the rural areas. Furthermore, the farmers cooperatives and associations (FCAs) that will receive the



machines will be able to provide services to other farmer and agribusiness companies, from land preparation to milling. This will result in an additional source of income for the FCAs.

"The first batch of farm machines to be distributed under RCEF also comprises locally-made machines, and the large numbers to be awarded under the first batch will require most farm machine fabricators to increase production and hire additional labor," Dr. Jallorina said.

PHilMech is set to distribute under the first batch the following farm machines: 576 hand tractors; 103 rice reapers; 52 precision seeders; 106 walk behind transplanters; 118 riding type transplanters; 347 floating tillers; and 46 rice mills. The first batch costs P2 billion.

As to the maintenance of the farm machines, PHilMech said the agency has already trained "trainors of trainers" who will educate FCAs on the need to maintain the machines. Also, the

495 four-wheel tractors and 356 rice combine harvesters, of which are imported, will require farm machine firms to increase their maintenance personnel.

Dr. Jallorina, however, believes that the biggest stimulus that the awarding of P5 billion worth of machines this year is the positive impact on the production of rice and other crops.

■ JMArayat





Engineer of PHilMech recognized for excellence

DR. MICHAEL A. GRAGASIN

received an award from The Manila Water Foundation for his invention at the Manila Water Foundation for Engineering Excellence (The Prize) Awarding Ceremony, last February 3 at Seda Hotel Vertis North in Quezon City.

In partnership with the Department of Science and Technology (DOST) and the Philippine Technological Council (PTC), The Prize honored Dr. Gragasin for his ingenuity and expertise as a science research specialist, along with three Filipino engineers.

Gragasin designed and led the development of the compact Corn Mill and the Impeller Rice Mill for white and brown rice to help low-income farmers increase their milling recovery and earn more profit.

Through his inventions, farmers can now process their own crops and don't have to depend on commercial millers. With these machines, farmers can now increase their income from P14 to P25 per kilo. Production costs for corn and rice, which are staple food in the country, are also maintained at a low cost making these grains more affordable for each Filipino.

Using the principles of agricultural engineering, the compact corn mill and impeller rice mill address the food



Dr. Gragasin received his Engineering Excellence award from The Manila Water Foundation (MWF) at Quezon City

security needs of Filipinos. Farmers can now afford machines that allow them to improve the quality of their yield and generate more income.

The Prize is an offshoot of a nationwide search for Filipino engineers who manifest excellent engineering and scientific competence to honor and help them promote their technologies.

It is the only recognizing body in the Philippines that honors engineers who made notable contributions in solving development problems in the areas of water, sanitation, environment, and sustainability.

■ JBLaturnas



AWARDING CEREMONY
The PHilMech team received their cash prizes, plaque and certificates in the National Invention Contest and Exhibits (NICE) at SMX Convention Center, Metro Manila

PHilMech wins in the National Invention Contest and Exhibits

REGIONAL WINNERS of the Regional Invention Contest and Exhibit (RICE) gathered at the SMX Convention Center in Metro Manila on March 3-5, 2020. This time, they will participate in the National Invention Contest and Exhibits (NICE)

The NICE is a biennial activity which showcases the Filipino's innovation and creativity. It recognizes efforts of local investors, innovators, researchers including the students as contributors to national economic development.

A total of 68 outstanding entries with the theme "Science for the people: Inventions and Innovations for Sustainable Development". The

contest is divided into five categories which are: Tuklas (Invention Category), UM (Utility Model Category), ID (Industrial Design Category), Likha (Creative Research Category) and Sibol (Student Creative Research Category).

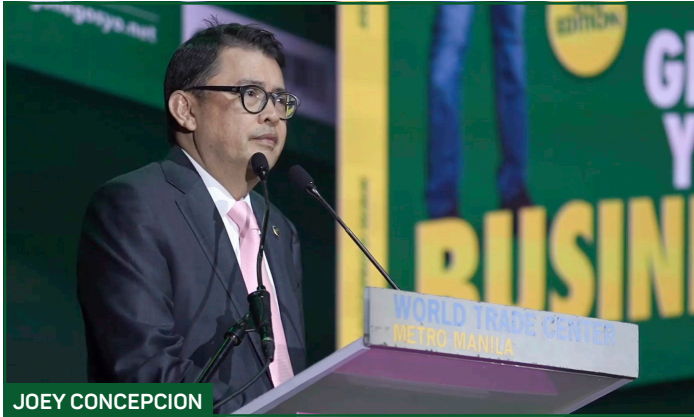
Among the five categories, the Philippine Center for Postharvest Development and Mechanization (PHilMech) competed in the Tuklas Category, Utility Model Category and Industrial Design Category. PHilMech achieved an outstanding 1st place in the Tuklas Category with Fluidized Bed Drying System and was also awarded a Gold Medal from the World Intellectual Property Organization (WIPO). In 2nd place, the Tractor Drawn

Cassava Digger won in the Utility Model Category and the Grain Probe Moisture Meter or Buriki in 3rd place in the Industrial Design Category. These technologies are all invented by the staff of the Agricultural Mechanization Division of PHilMech.

The winners received cash prizes, plaque and certificates of recognition from the Department of Science and Technology – Technology Application and Promotion Institute. The World Intellectual Property Organization (WIPO) also provided awards and certificates for the first place winners. Overall, PHilMech showed an excellent performance in the National Invention Contest and Exhibits. ■ **PMFukasawa**



Women achievers in Asia recognized in 2020 Summit



JOEY CONCEPCION



SEC. WILLIAM DAR

(left) Speech of Presidential Adviser on Entrepreneurship, Joey Concepcion during the Summit 2020

(right) Sec. William D. Dar on his thanks giving message to Go Negosyo helping farmers

THEY CAME IN FULL FORCE. They are women achievers in business, politics, agriculture, entertainment, health and wellness from the Philippines and the rest of Asia. They were recognized during the Women Entrepreneurship Summit 2020.

The event graced by about 12,000 women in the public and private sectors of the country was held at the World Trade Center in Pasay City on Mar 2-3, 2020 as part of the country's celebration of women's month. The ASEAN Business Advisory Council of the Philippines in partnership with Go Negosyo, organized the summit.

Communicators from the Applied Communication Division of the Philippine Center for Postharvest Development and Mechanization (PHilMech) and who are part of the agency's Gender and Development (GAD) focal point system witnessed and participated in the event. This

was simultaneously done with the ceremonies at PHilMech for women's month.

Presidential Adviser on Entrepreneurship and Go Negosyo founder Joey Concepcion told the largely women audience: "Our efforts in the government under President Rodrigo Duterte whose passion is to help Filipino people, is to mobilize the private sector together with DTI, DA, DoT. We are moving heaven and earth, to help fulfill your dreams to become one of the successful entrepreneurs..."

The two day activity featured women of impact, women of legacy, women of style and substance, women of the earth, women of the world, and women of the future.

Women achievers from the Philippines included Ambassador Delia Albert, Secretary of Foreign Affairs in Asia; Doris Magsaysay of Magsaysay Shipping; Agares Asuncion of Agnes

Dragon Cactus Herbal Soaps; Rosalina Wee of W Group, among others.

From Asia, women awardees included Kemariale Dumaranas (Brunei), Lok Chum Teasmao Charkajm (Cambodia), Veronica Colandan (Indonesia), Manola Daronvong (Laos), Hao Ling Tan (Malaysia), Khin Lay (Myanmar), Delia Albert (Philippines), Mao Luang Prea Yapun Swidhavat (Thailand) and Madame Nguyen ThiNga (Vietnam).

Secretary of Agriculture Dr. William Dar also came. He said: "We are happy to report that after six months in office, marami na po kaming programa para sa millenials, para sa kababaihan, para sa gustong magfarming..."

Celebrity guests also came and shared insights on women empowerment. They included Miss Universe 20-18 Catriona Gray, Charo Santos Concio of ABS-CBN, dermatologist Dr. Vicky Belo, and so forth. ■ MBGonzalez



Gawad Juana Award for PHilMech engineer

IN CELEBRATION of the National Women's Month, the Philippine Center for Postharvest Development and Mechanization (PHilMech) honored Engr. Arlene C. Joaquin with the Gawad Juana Award for her ingenuity and knowledge in agricultural research & development, last March 2 at the PHilMech Training Hall.

Arlene Coloma Joaquin, Senior Science Research Specialist of the Agricultural and Machinery Division has been with PHilMech for 26 years. Her area of expertise is in Agricultural Production Chain Management, specifically Postharvest Technology and Logistics.

Inspired to create something that would directly help the farmers and localize agricultural machines, Joaquin designed and led the development of three gender-friendly, award-winning technologies.



Engr. Joaquin during his presentation of Grain Probe Moisture Meter, a PHilMech technology

The Grain Probe Moisture Meter was designed to integrate a moisture sensing mechanism to the popular tool "buriki" and offers accurate and rapid measurement of moisture content of paddy and corn in bags. The Coffee Moisture Meter is an

inexpensive alternative yet accurate coffee moisture meter for green coffee beans and coffee parchments. The Computer Vision System (CVS) for Mango Sorting and Grading sorts the good mangoes from the bad ones with the use of a specific program with the help of a camera in only a few seconds.

Through her inventions, farmers can now sample grains and read moisture content in an easier way. Coffee farmers, buyers and processors no longer need to stick to the traditional, subjective, slow and destructive method of checking moisture content, and local market can avoid unfair trading.

■ JBLaturnas





PHilMech to collaborate with SEARCA on Farm Mech



SEARCA PLANNING

Meeting of SEARCA, PHilMech and PhilRice tackling the RCEF mechanization component

SOUTHEAST ASIA REGIONAL Center for Graduate Study and Research in Agriculture (SEARCA) paid a courtesy call to PHilMech, January 21.

In attendance were PHilMech division chiefs led by PHilMech Director I Dr. Arnel Ramir M. Apaga, SEARCA Director Dr. Glenn B. Gregorio, SEARCA Deputy Director Joselito G. Florendo and other key officers and staff, as well as PhilRice staff.

PHilMech welcomed SEARCA with gratitude for their active participation in increasing knowledge on farm machinery, as well as changing the mindset of farmers.

“The role of SEARCA is vital, especially on education in trying to change the

paradigm of our farmers. It’s easy to give them (farmers) technologies; the challenge is how we can strengthen the capacity, from the attitude to the technological know-how of our farmers and other stakeholders,” said Dr. Apaga.

“We would be very happy to collaborate again with SEARCA in pursuit of postharvest and mechanization,” Dr. Apaga added.

Moreover, PHilMech shared their future plans and presented the mechanization component of the rice tariffication law.

SEARCA also expressed interest to continue helping PHilMech in terms of promoting farm mechanization

among farmers and modernizing the agricultural sector.

“It’s nice to have a connection. I think this would be the right time to revitalize our partnership, especially because there’s too much pressure on PHilMech with RCEF and that’s why we have to look out for each other,” said SEARCA Director Dr. Glenn B. Gregorio.

SEARCA’s visit was part of their 11th Five-Year Plan at the Lifelong Learning Series of the Philippine Rice Research Institute (PhilRice) “2020: A Clear AgriVision for Tomorrow”.

■ JMBLaternas



ACTUAL TRAINING AND DEMONSTRATION

Demonstration of making the soy embutido, soyballs and soy okay at DOST, Lamut, Ifugao

Enhancing the skills of rural women in soybean processing

THE PHILIPPINE CENTER for Post-harvest Development and Mechanization (PHilMech) in collaboration with the Department of Science & Technology (DOST)-Ifugao, Department of Agriculture (DA), Cordillera Administrative Region and the Bureau of Agricultural Research (BAR) conducted three-day training on soybean processing into food in DOST, Lamut, Ifugao last March 4-6, 2020.

The training aimed to enhance the skills of rural women in soybean processing and help ease the effect of COVID 19 in the agriculture sector. Around 26 women and four men attended the training and most of the participants were rural women who are members of farmers association assisted by DOST. Other participants came from the local government of Lamut, ifugao, Ifugao State University

and other private sectors. Engr. Genna B. Jallorina, the head of DOST, Ifugao initiated the conduct of training because she believes that soybean processing is a profitable enterprise and it is one way in helping rural women to earn/increase their income.

Dr Ma. Cecilia R. Antolin (PHilMech) presented the role of PHilMech in the national soybean development program, PHilMech developed postharvest and processing systems for soybeans. Ms. Jenny Castañeto of the Bureau of Agricultural Research (BAR) briefed the group on the different programs implemented and funded by BAR including that of soybeans.

PHilMech brought the processing equipment used in the training. The resource-speakers were mostly

PHilMech cooperators in soybean project and from Quirino State University based in Diffun, Quirino. The speakers shared their knowledge on soybean processing through lectures and demonstrations. The processed products are soymilk, soy taho, tokwa, soy pandesal, langgonisa, burger, siomai etc. The lecturers also shared their success stories and the problems they encountered in soybean processing.

On the last day of the training, visits were done at the successful soybean processors in Santiago City, Isabela and Cagayan Valley Integrated Agricultural Research Center (CVIARC), Isabela. Mr. Wilyard Bautista, the processor/owner explained how the business started and showed the processing center.

Soy milk and tofu were served during the visit. He said that the key to success in business are honesty and not to say anything against the products of the competitors. Most important also is to put God the center of the business. The visit to CVIARC was very fruitful. Different machines such as roasting machine, pulverizer, vacuum packaging machines and other processing machines were demonstrated to the participants. Through the generosity of RTD Rose Mary Aquino (DA-RFO 2), every participant was given one kilogram of soybeans for processing. Other participants purchased seeds for planting.

The training and exposure of the participants to successful entrepreneur envisions to inspire them to engage in soybean processing business. ■ **MaCRAntolin**



GAD agenda setting, planning and budgeting workshop held



LAKBAY PALAY

Workshop participants with GAD resource person, Ms. Jemelle Milanes (6th from right)

THE PHILIPPINE CENTER for Postharvest Development and Mechanization (PHilMech) conducted “Workshop on the Formulation of PHilMech GAD Agenda, Planning and Budgeting (2020-2023)” at Prince Plaza Hotel, Baguio City last January 23-24.

The two-day workshop aimed to increase the skills of GAD Focal Point System (GFPS) members and program implementers on gender analysis and developing GAD programs.

“Sa GAD Planning and Budgeting, it should be issue-based. It should be based on the needs of your

employees, and at the same time your clients kasi ‘yun po ‘yung ina-address po natin dito. The practical needs and strategic needs ng inyong internal and external clients so, hindi po siya hinuhugot kung saan-saan,” said Ms. Jemelle Zamora-Milanes, an independent consultant from the Philippine Commission on Women (PCW), when asked about how to form a GAD Plan and Budget.

Ms. Milanes oriented the participants on the development guidelines of GAD Agenda, Gender Mainstreaming Evaluation Framework (GMEF), and GAD Planning and Budgeting. She also facilitated PHilMech’s Gender Audit

using GMEF tool to assess the gender mainstreaming level of the agency.

Thirty participants composed of GFPS members, ExeCom, selected project leaders and staff and, officers from Planning, Management, Information and Technology Division (PMITD) and Admin Division (AD) attended the said activity.

PHilMech’s three-year GAD Agenda draft and 2020 GAD Plan and Budget were the output from the workshop.

■ CLValmonte



PHilMech joins 7th Uhay Festival

THE PHILIPPINE CENTER for Postharvest Development and Mechanization (PHilMech) joins the Science City of Muñoz (SCM) as it celebrates its 7th Uhay Festival and 19th Charter Anniversary, January 20 at SCM.

With the theme, “Ani ng Sining at Agham”, PHilMech’s float adorned the festival civic parade by showcasing the role of mechanization in agriculture. It also highlighted its participation in the RCEF implementation.

The parade embodied the unity of different local, national and non-government organizations, and students based in the SCM. It also showcased the creativity and resourcefulness of the citizens in the city.



(top) Assembly of PHilMech employees
(down) PHilMech’s Uhay Festival float

To lift the morale of employees and promote camaraderie, PHilMech employees also attended Employees’ Night last January 10.

As highlight of the program, awards were given to outstanding SCM

employees who brought honor and pride to the city, including Dr. Michael Gragasin, for his efforts to make farming practices more efficient through his expertise in agricultural engineering.

Uhay Festival is one of the most important events in SCM. Festivities start in December 9, as Muñozonians observe their cityhood anniversary as the Science City. Street dancing, Christmas lighting, basketball tournaments, dance festivals and other activities are conducted across the city.

■ JMBLaternas



What is Cacao?

Theobroma cacao, the scientific name of Cacao, literally translates as “food of the gods” in Greek. Cacao is the Mayan root word to describe the tree and its product. It is grown mainly for its seeds known as the cocoa beans which are used to make cocoa mass, cocoa powder and chocolate.

Cacao Processing

PHilMech has optimized the use of waste products from Cacao leading to production of wine, vinegar, healthy drinks and fuel briquettes, and ethanol.

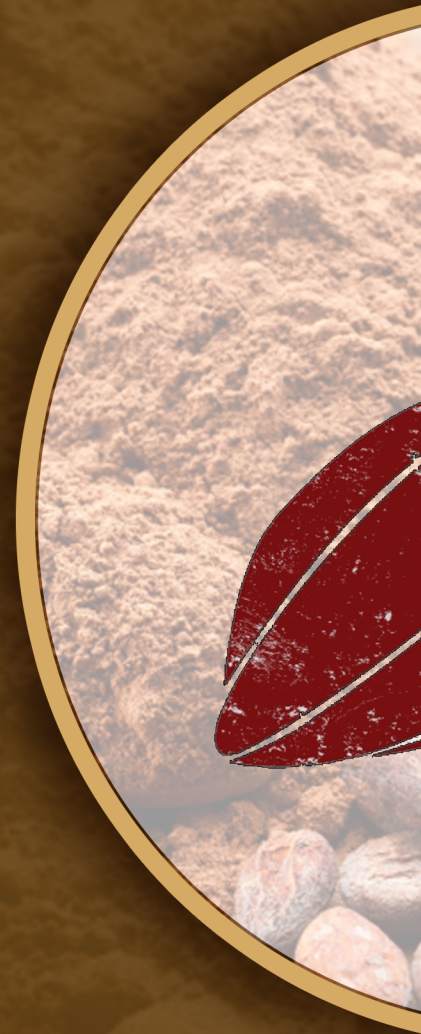
These products and individual processes, it can be integrated into a complete processing system by establishing a cacao by-products processing enterprise that can enhance the income of cacao growers/processors and address the problem on waste disposal and environmental pollution at the same time.

Technologies to Watch

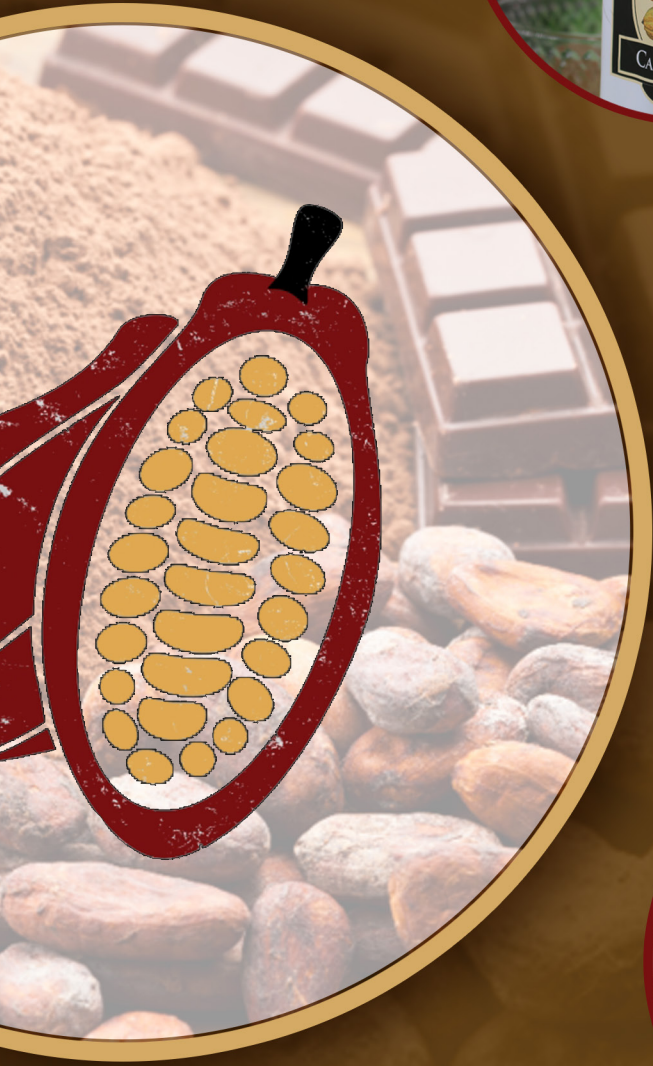
Village-Type Tablea Processing Machines

- 1. Drum-type Cacao Bean Roaster*
- 2. Cacao Bean Huller*
- 3. Cacao Refiner*

products
Cacao



from
wastes



SODA



WINE



VINEGAR



ALCOHOL



FUEL
BRIQUETTES

WASTE-PRODUCT UTILIZATION



THERE IS MORE TO CACAO PROCESSING

.....
Jett Molech Subaba

If you think cacao is only for producing chocolates, think again! The Philippine Center for Postharvest Development and Mechanization (PHilMech) research team in partnership with the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) and Technology Application and Promotion Institute (TAPI) of the Department of Science and Technology (DOST) is now producing wine, vinegar, ethanol, health drinks and fuel briquettes from cacao wastes.

Traditionally, cacao processors only collect the beans to process as chocolate while the pod husk, drippings and hull of cacao, which comprises of 80 to 85% of the weight of fresh pods, become wastes and has economic value (Caparino, et al., 2015).

In a study led by Engr. Andres M. Tuates Jr., they saw the potential of converting these wastes into value-added products that can enhance the income of cacao growers and processors and at the same time address the problem on

waste disposal and environmental pollution.

With the appropriate and food-grade facilities and equipment identified and designed by the research team like the cacao pod washer, soaking tank, pods cage, pod breaker, extraction table for net beans, stainless fermentary box and briquetting system, the processing of the cacao pod husk and drippings into vinegar, wine, health drinks and fuel briquettes became possible.



Photo taken from @WeAreNurturers



Based on the laboratory-scale study conducted by Tuates, et al. in 2016, it was found out that the wine, vinegar and healthdrinks extracted from cacao drippings/ sweatings have passed Philippine standards in terms of the total soluble solids, alcohol and total titratable acidity. In terms of its microbial load, these products are on a very safe level based on the USDA standards. Moreover, it was concluded that these products are generally acceptable of ages between 20 to 55 years old.

On a different study conducted by Caparino et al. (2016), it was found out that the energy values and combustion qualities of cacao pod husk are sufficient for cooking food at home and even for industrial application. These pod husks were then turned into fuel briquettes.

It was found out that farmer-cooperators were receptive of the cacao sweatings/drippings processing because it can address the waste management problems in the community and can increase their income of about 8 to 12

pesos per kilogram of wet beans particularly on healthdrinks, wine and vinegar.

These facilities, products and processes were integrated into a complete waste processing system by establishing a village-type cacao by-products processing enterprise. In a bigger picture, this establishment addresses the industry constraints identified in the 2016-2022 harmonized cacao industry road map of Department of Agriculture (DA) and Department of Trade and Industry (DTI) (2017): (1) the limited value adding activities in the processing aspect; and (2) the low farm productivity level and inadequate postharvest facilities and infrastructure in the production aspect.

Currently, five sites were identified for the pilot testing of the village-type enterprise. These are located in the Bicol Region and in Davao Region—the highest producer of cacao or 80% of the total production of the country (BAS, 2015). These cooperators are the Albay Pili and Cacao

Industry Association (APCIA) and the Mayon Farmers Association (MFA) in Albay; and the Cocoa Foundation of the Philippines, Inc. (CocoaPhil), Rosit Cacao Farms and KTV Farms in Davao City. Moreover, the research team has seen the establishment of the village-type processing enterprises a potential to become a techno-demo site, a venue for field trips for farmers and processors, an immersion site for students to showcase the actual operation and processing of cacao wastes.

These interventions of PHilMech will not just boost community productivity but can also boost the national cacao industry as a whole. These researches and its results can directly contribute to the national action plan of the government in attaining the 2022 Philippine cacao challenge. PHilMech efforts will fall on three of seven upscaling strategies laid down in by the government—(1) improvement of farm productivity, (2) promotion of value-added products, and (3) the continual research and development.



Cacao, Chocolates and Other Cocoa Trivia

Mila B. Gonzalez

Are you a chocolate lover? Many people, young or old, love chocolates. Whether as a love gift or *pasalubong*, chocolates bring out the sweetest smiles for the givers and benefactors.

But have you ever wondered how chocolates are made? Here are a few trivia to help you understand something much loved and sought-after food.

The cacao tree

Chocolates come from cacao that grows on the trunks and branches of cacao trees. Red to yellow-orange cacao fruits are harvested from the cacao trees. A mature tree produces 20 to 30 cacao pods each year.

When the cacao fruit is opened, it will show white pulp where seeds, 40 or more, are embedded. From these seeds will come the chocolates.

The cacao tree which can grow as high as eight meters can live up to 100 years but it bears fruits for only 25 to 30 years. Cacao tree grows best in tropical areas. In the country, Davao Region is the highest producer of cacao. But the highest cacao producing countries are Ivory Coast and Ghana, both in West Africa. Their combined production constitutes more than half of the world's output.

More chocolate treats

Do you know that chocolates, according to researches, reduce the risk of heart disease? Also, the darker the chocolate, the lesser fat and sugar it contains. Dark chocolates has more flavanols which can help lower blood pressure and cholesterol. Flavanol is a plant-based anti-oxidant.

So, how is chocolate made? Chocolate transforms from cacao bean to chocolate bar? The following general steps: (1) harvesting, (2) fermenting, (3) drying, (4)



Chocolates

Photo taken from wallpapercrave.com

roasting, (5) cracking and winnowing, (6) grinding and conching, (7) tempering, (8) molding, and (9) wrapping (readcacao.com/blog).

Yes chocolates are so special, they are prepared with much care, time and effort to come up with a high quality chocolate with melt-in-your mouth texture.

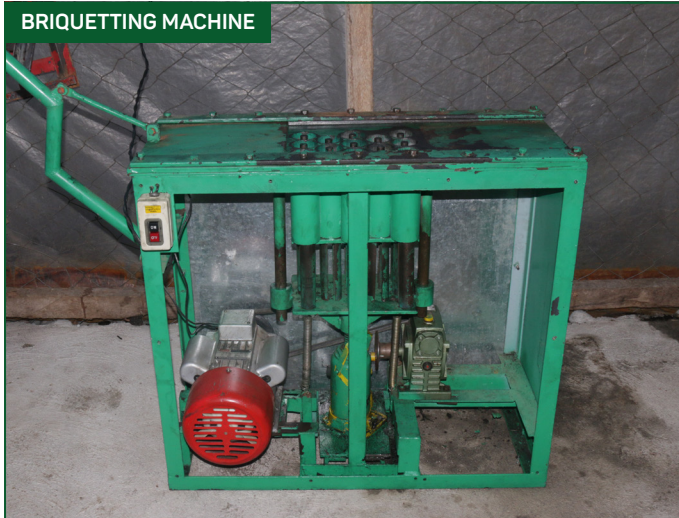
What makes a healthy dark chocolate? It should have higher cocoa content (60% or more), low sugar content, few additives and other ingredients, no added flavor, no preservatives, not processed with alkali, and processed with low temperature (healthyeater.com).

Do you know that the Philippines produces this kind of healthy, pure, 100% unsweetened dark chocolate? Yes, in Tagbilaran City, Bohol where the chocolate princess lives and where the Chocolate Hills is located.

Cocoa trivia and more

What is the difference between cacao and cocoa? The two words seem interchangeable. But here is the difference. Cacao is the bean and cocoa is what is made from the bean. Cacao is the natural state before it is fermented and roasted. Cocoa is the processed state. So we have cocoa liquor, cocoa butter, cocoa powder, and so forth.

Photo taken from chicvegan.com



BRIQUETTING MACHINE



BRIQUETTES

PHILMECH-DEVELOPED BRIQUETTING MACHINE

The PHilMech Briquetting machine is a piston-type that allows the biomass to be punched into a die by a reciprocating ram with a very high pressure thereby compressing the mass to obtain a compacted product.

FEATURES:

- Batch type
- Equipped with prime mover to lessen the human effort
- Produce briquettes from any biomass
- Can be operated by female
- Made of locally available materials

SPECIFICATIONS:

- Capacity: 100-120 kg/ day
- Prime mover: 2 hp electric motor
- Densification: Piston type
- Cylindrical briquettes
 - Length: 50mm
 - Outside Diameter: 50mm
 - Inside Diameter: 16mm

When cocoa liquor, cocoa butter and sugar are mixed, dark chocolate is formed. Add milk into the mixture and a milk chocolate is produced. White chocolate, on the other hand, is formed with the mixture of cocoa butter, sugar and milk powder (lakechaplainschocolate.com).

Cacao research advances

Cacao processing is time consuming and laborious. But research and development efforts are being done. The Philippine Center for Postharvest Development and Mechanization (PHilMech) is finding ways to ease the burdens of cacao processors and growers in the country.

Photo taken from shutterstock.com

Cacao technologies are being developed. Heard of stainless steel fermentation boxes? Greenhouse solar tunnel dryer for cacao beans? These are just among the cacao technologies being developed by PHilMech engineers and researchers.

So there is light at the end of the tunnel for burdened cacao processors. There is also hope for our cacao growers and farmers.

References:

bohachronicle.com.ph/2019/06/17
Global-organics.com. *Chocolate and Cocoa Terms Defined*
healthy eater.com. *Dark Chocolates*
lakechaplainschocolate.com
readcacao.com/blog



AWARD-WINNING RESEARCHERS

(left) On-going program of Women's Month together with PHilMech employees (right) Executive Director, Dr. Jallorina, on his appreciation message



DIRECTOR BALDWIN'S SPEECH

PHilMech celebrates Women's Month

THE PHILIPPINE CENTER for Postharvest Development and Mechanization (PHilMech) joined the commemoration of National Women's Month Celebration (NWM) in a kick-off activity last March 2 at PHilMech Training Hall.

With the annual theme "We Make Change Work for Women", PHilMech highlighted the government's pursuit for a development anchored on true compassion and real change.

GAD Focal Person Dr. Helen F. Martinez gave a brief background about the celebration and explained the importance of recognizing

women's achievements throughout history and across nations. Schedule of activities for NWM included a 20-Minute Gender Awareness Campaign and the Unveiling of the Upgraded GAD Corner.

To highlight women as active contributors to and claimholders of development, A Gawad "JUANA" Award was given to Engr. Arlene C. Joaquin for being a woman of caliber with high achievements in the field of agricultural research and development.

PHilMech celebrated NWM to raise awareness for the contribution of

women in history and to highlight the government's efforts to further gender and development.

The observance of the annual National Women's Month in March is pursuant to Proclamation No. 224 s. 1988, declaring the first week of March each year as Women's Week and March 8 as Women's Rights and International Peace Day; Proclamation No. 227 s. 1988 providing for the observance of the Month of March as Women's Role in History Month; and Republic Act (RA) 6949 s. 1990 declaring March 8 of every year as National Women's Day. ■ CLValmonte



MANCOM MEETING

PHilMech executives photo after the women's month program



MA'AM LALAC'S SPEECH

Mrs. Martinez's opening remarks during the celebration of Women's Month



RECOGNITION

PHilMech Executive Director together with Dr. Helen Martinez



FREE COFFEE

Coffe break with Division chiefs



GENDER AWARENESS CAMPAIGN

GAD activity with PHilMech employees



GENDER AWARENESS CAMPAIGN



Uploaded by: **Patrick Vincent Barrientos**
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AFACI recognizes PHilMech as outstanding country winner



MORINGA PROJECT



DR. CAPARIÑO

(left) Dr. Capariño together with the members of one of the project cooperators at the on-going construction of the moringa processing area and office (right) AFACI Program Workshop at Bangkok, Thailand

THE PROJECT of Dr. Ofero Capariño, "Production of Moringa (*Moringa oleifera*) Powder using Multi-Commodity Solar Tunnel Dryer (MCSTD)" gained the 2019 Outstanding Asian Food and Agriculture Cooperation Initiative (AFACI) Country Winner representing the Philippines under the category of Development of Agricultural Product Processing Technology (APPT). APPT is one of the five on-going projects funded by the AFACI-Rural Development Administration (RDA) based in Jeonju, South Korea, geared towards processing technology development on target agricultural commodity, which can easily be processed

by small-scale food producer and processors.

AFACI announced in their facebook page on 17 February 2020 two country winners for each category e.g. Philippines and Indonesia under APPT and Indonesia and Bangladesh on Salinity Tolerant Rice (STR).

The Moringa project formally commenced in April 2019 after the kick-off workshop held on March 12-15, 2019 in Rural Development Administration (RDA), South Korea. The main objective of the project is to increase the income of farmers in the villages through the production of high

quality, safe and shelf-stable Moringa powder by using MCSTD.

Dr. Capariño will receive his award as Outstanding Principal Investigator this October 2020 as the funded projects renew and look for more efficient and effective project implementation.

Yearly, project evaluation workshops of AFACI-funded projects are conducted in all member-countries in the Asian region to share their knowledge and experiences in agricultural technologies and extension services for sustainable agricultural development that could help local farmers, food producers and processors. ■ DMCCapariño



ENGR. ALDRIN E. BADUA

Chief of the Applied Communication Division (ACD)

ACD has a new Chief

ENGR. ALDRIN E. BADUA, one of PHilMech's outstanding employees, assumes a new position as the chief of the Applied Communication Division on February 3, 2020. He took an oath of office during the first Monday program held at the PHilMech training hall, officiated by PHilMech Director Baldwin G. Jallorina.

The new chief succeeded Dr. Rodolfo P. Estigoy after his retirement in November 2019. Engr. Badua has been in the government service since 2004. He has a strong career background prior to his appointment.

For the past 16 years, he has held significant positions and responsibilities in and out of the country. In 2007, he was one of the technical staff who implemented the Mechanical Drying Program of the Department of Agriculture. Also, in 2011, he led the nationwide implementation of the DA-Mechanization Program—one of the

most crucial yet successful programs of DA as the use of rice machines was introduced to the farmers.

In 2011, he served as a consultant of the Food and Agriculture Organization (FAO) of the United Nations in Dar Es Salaam, Tanzania, to prepare the mechanization roadmap of the East-African countries. He was also sent for special missions to Papua New Guinea in 2013 to seek out possible agricultural collaboration for the Philippines.

Last year, as the Rice Tariffication Law was passed, it makes possible the provision of the Rice Competitiveness Enhancement Fund (RCEF). Half of this a multi-billion project, every year, will be entrusted to PHilMech for the Mechanization Program.

Engr. Badua was one of the pioneers who led in crafting the proposal and implementing guidelines of the RCEF-Mechanization Program. He,

then, became the first chief of the newly created division of PHilMech, the Facility Management and Field Operations Division (FMFOD), where he was able to lead the first year of implementation of RCEF-MP.

With all those significant responsibilities, it is no wonder why Engr. Badua was recognized three-time by the agency as the *Natatanging Kawani* ng PHilMech awardee in 2008, 2011 and 2013.

Communication Background

With his affiliation with the Philippine Society of Agricultural and Biosystems Engineers (PSABE), aside from holding high positions for the past many years, he also led the production of communication materials for the organization. He was lauded for his innovation and creativity in producing materials like the PSABE newsletter.

In September 2020, Engr. Badua will earn his Doctor's Degree in Rural Development, minor in Development Communication at Central Luzon State University. He has also finished his Masters in Rural Development in the same university in 2015.

Behind these accomplishments, Engr. Badua remains an approachable and humble employee towards his peers and his subordinates.

His principles in life is anchored in a bible verse—Philippians 4:13—which says "I can do all things through Christ who strengthens me".

■ JMGSubaba



NEW AUDITOR

Newly appointed auditor of PHilMech (3rd from lower right) together with the Director III, Director I and section heads of PHilMech

Newly appointed auditor of PHilMech

THE PHILIPPINE CENTER for Postharvest Development and Mechanization welcomed the newly appointed auditor, Ms. Maria Leilani M. Otic last February 19, 2020 at the PHilMech Training Hall. Her official duty as the new auditor took effect in March 2020.

Other auditors of LGU and different agencies in the province of Nueva Ecija expressed their support to their fellow auditor.

The program was led by Director III, Raul R. Paz and Director I, Arnel Ramil M. Apaga with the presence of each

section heads and representatives. Ms. Otic was also the official auditor of the Philippine Carabao Center (PCC), Science City of Muñoz.

The previous auditor of PHilMech was Mrs. Benilda C. Belisario. She is now retired from government service.

■ DMCCapariño



Development of Commercial and Industrial Products from Cacao Sweating

BIO-PROCESS ENGINEERING DIVISION
 Andres M. Tuates Jr., PAE, Princess D. Veneracion, Shiela Marie A. Villota, Otero A. Capariño, Ph.D.

RATIONALE

Cacao beans must be fermented properly to produce good quality beans for marketing and processing into various products and applications. However, in the traditional practice of fermentation which uses wooden fermentation boxes, the generated cacao sweatings are not edible and create foul odor and air and water pollution.

Given these, an alternative process and technique in collecting food grade sweating intended for processing into usable products including wine, vinegar, alcohol and health drinks is necessary. Utilization of cacao sweating, which is considered "waste" will help address the problem of waste disposal and other environmental concerns.

OBJECTIVES

The general objective of the project was to utilize the cacao sweating as raw material in the production of commercial and industrial products. It specifically aimed to: characterize the physicochemical properties of cacao sweating; formulate and develop wine, vinegar, ethanol and health drinks using cacao sweating; and evaluate the sensory attributes of cacao sweating based products.

METHODOLOGY

Food grade cacao sweatings/drippings undergo different sets of processes to be converted into the desired product.

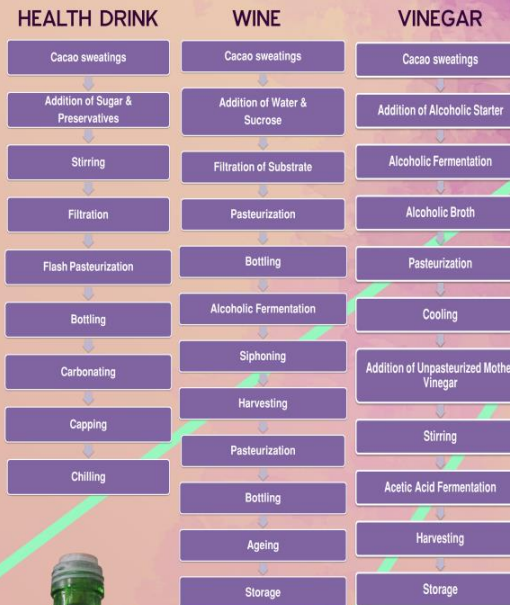


Table 1. Physico-chemical characteristics of sweatings

Parameters	Mean Value
pH	4.67±0.252
Total Soluble Solids (Brix)	13.5±0.300
Total Titratable Acidity (Tartaric acid %)	0.803±0.053
Total Titratable Acidity (Citric acid %)	0.643±0.043
Density (g/ml)	1.028±0.010

RESULTS

PHYSICO-CHEMICAL PROPERTIES



CACAO HEALTH DRINK

Total Soluble Solids: 12 °Brix
 Total Titratable acidity: 0.754%
 pH: 3.6

The pH value of cacao sweating is higher than the pH value of orange juice (3.23-3.53) (Esteve et al. 2005).



CACAO WINE

Ash content: 0.335%
 Total acids: 0.758%
 Fixed acids: 0.516%
 Volatile acids: 0.242%
 Specific gravity: 0.998
 Ethyl alcohol: 12.6%
 n-Propyl alcohol: 12.8%

No total aldehydes and iso-butyl alcohol was detected.

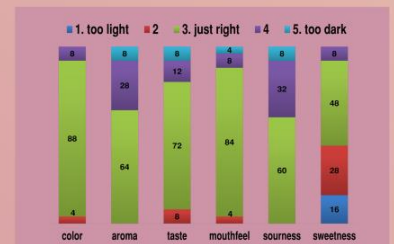
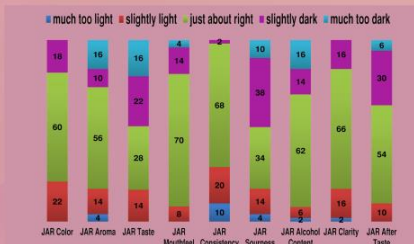
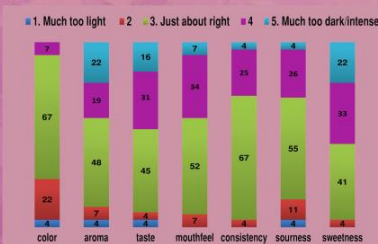
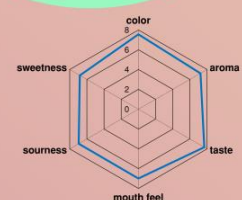


CACAO VINEGAR

Total solids: 5.79%
 Ash content: 0.159%
 Alkalinity: 0.253 ml
 Non-volatile acids: 0.492%
 Total Titratable acidity: 5.36%
 Total Soluble Solids: 8.29°Brix
 Non-volatile reducing: 3.31% substances
 Permanganate oxidation: 13.1 number

SENSORY ATTRIBUTES

DEGREE OF LIKING OF SPECIFIC ATTRIBUTES



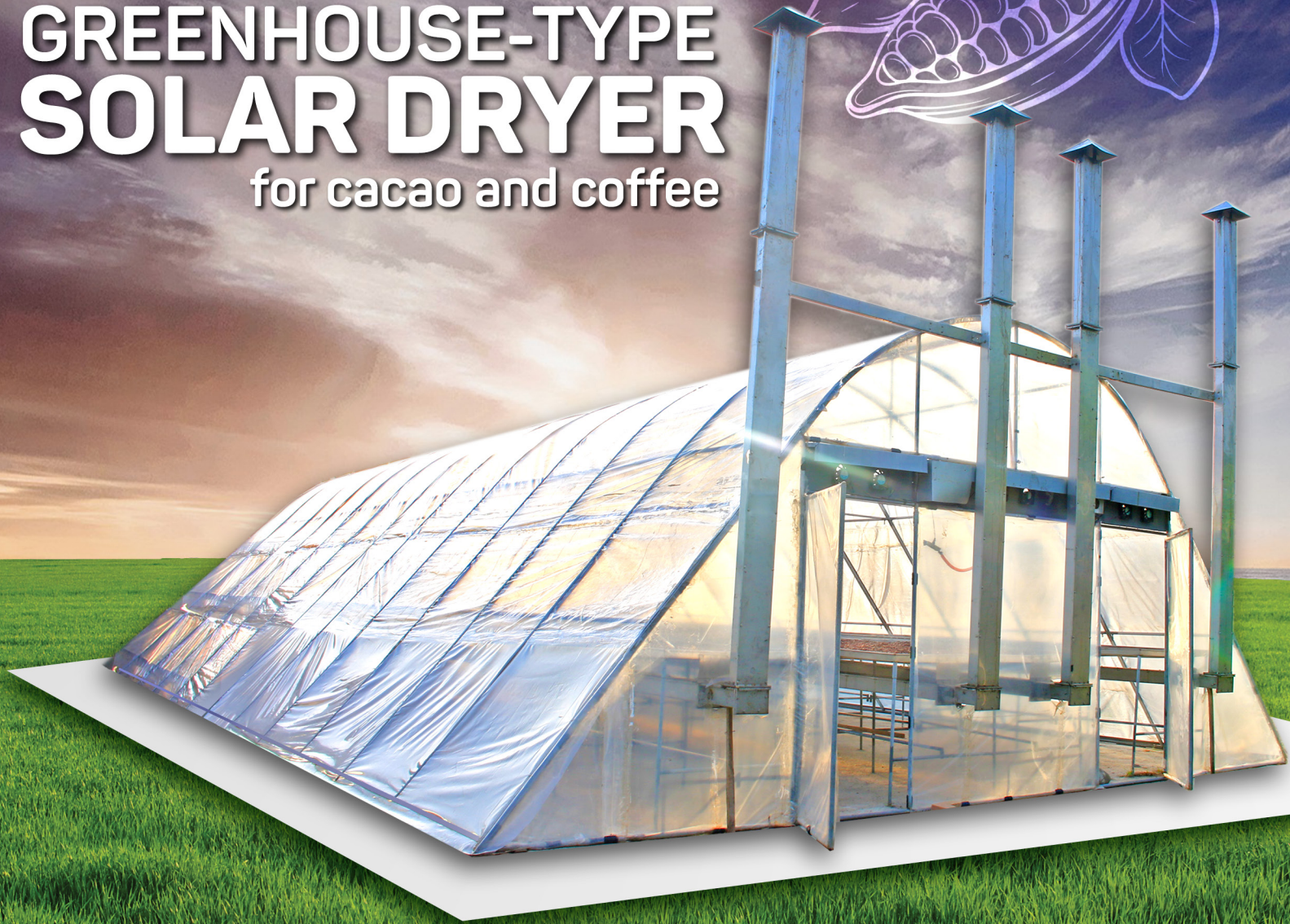
CONCLUSION

Processing of cacao sweatings into wine, vinegar, and health drinks are another way of utilizing the cacao wastes instead of allowing them to flow freely in the fermentary area. The processed products will be a good source of income of cacao processors and growers.



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