



## RESEARCH PAPER

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## A SWOT analysis in advancing Cacao processing technology and commercialization of Cacao food products in the Municipality of Lasam, Philippines

Bernard P. Madarang\*

*Cagayan State University, Lasam, Philippines*

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### Abstract

This paper presents the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of a proposed model aimed at advancing cacao processing technology and commercialization of cacao food products in the Municipality of Lasam, Philippines. The analysis was conducted based on in-depth interviews and focus group discussions with key stakeholders involved in the cacao industry, including cacao farmers, processors, local businesses, industry experts, and government officials. The study identifies several strengths that the proposed model can leverage for successful implementation. Firstly, the presence of the Cagayan State University at Lasam offers a robust academic and research foundation in agriculture and food technology. Collaborative efforts with the Department of Science and Technology Region 02 further enhance research capabilities and access to resources. Additionally, the region's abundant natural resources, favorable climate, and fertile soil create an ideal environment for growing high-quality cacao beans, allowing the model to focus on sustainable cultivation practices and optimized processing techniques. However, the proposed model also faces weaknesses that need to be addressed to ensure its success. Lack of capacity-building among local farmers and stakeholders in cacao processing is identified as a challenge. To overcome this, the model should prioritize community empowerment and knowledge-sharing initiatives through workshops and training programs. Limited infrastructure for cacao processing necessitates public-private partnerships and securing funding from various stakeholders to establish a modern processing center. The analysis also highlights numerous opportunities for the proposed model. Rising demand for high-quality and sustainably produced cacao products both domestically and internationally presents a favorable market trend. By promoting responsible cultivation practices and forming partnerships with local chocolate manufacturers and confectioners, the model can tap into the growing market for value-added cacao goods. The study identifies potential threats that may hinder the model's implementation. Competition from other cacao-producing regions and external factors such as climate change and disease outbreaks pose challenges. To address these threats, the model should emphasize the unique characteristics of Lasam's cacao beans, implement climate-smart agriculture practices, and establish disease surveillance and management systems.

\*Corresponding Author: Bernard P. Madarang ✉ [bernardmadarang@yahoo.com](mailto:bernardmadarang@yahoo.com)

## Introduction

Cacao, also known as *Theobroma cacao*, is a significant agricultural crop that holds a unique position in the global agricultural landscape. With its origins in the tropical regions of the Americas, cacao has transcended geographical boundaries to become a vital commodity in the international trade market. Its significance extends beyond economic value, as cacao cultivation supports sustainable livelihoods for millions of smallholder farmers and fosters social and cultural ties within communities. The global agricultural sector is increasingly acknowledging the urgent need for sustainable development practices. The United Nations' Sustainable Development Goals (SDGs) serve as a comprehensive framework to address pressing global challenges, including poverty eradication, food security, climate change, and responsible resource management. Among the 17 interconnected SDGs, cacao plays a prominent role in achieving multiple objectives.

The cacao industry in the Philippines holds immense promise for driving rural development and contributing to global sustainable development objectives. By embracing responsible cultivation practices, empowering local communities, and fostering innovation, the cacao industry can be a transformative force for economic growth, poverty reduction, and environmental conservation. By recognizing cacao's full potential and working collaboratively, stakeholders can ensure a sustainable and equitable future for generations to come. Embracing responsible cultivation practices is essential to ensure the sustainable growth of the cacao industry. Sustainable farming methods, such as agroforestry and intercropping, can promote biodiversity and soil health while optimizing land use (Philippine Statistics Authority, 2021). By adopting these practices, farmers can increase their yields while minimizing the environmental impact. Empowering local communities is another critical aspect of promoting sustainable cacao production. Providing farmers with access to training, education, and resources can enhance their knowledge and skills in cacao cultivation and processing (Guinto & Almoneda, 2018). Empowered farmers are better

equipped to adopt sustainable practices and improve their productivity and income.

Innovation in cacao processing and commercialization is vital to add value to cacao products and access higher-value markets. Investing in modern processing facilities and technologies can improve the quality and consistency of cacao products, making them more attractive to consumers and businesses (Asian Development Bank, 2017). Moreover, fostering innovation in product development can lead to the creation of unique and high-demand cacao food products. The cacao industry, when viewed beyond a mere commodity, is recognized as a catalyst for positive change. It has the potential to drive economic growth by generating employment opportunities and increasing export revenues (Aures, 2020). By creating a sustainable and inclusive cacao value chain, the industry can contribute to poverty reduction and social development, particularly in rural areas where cacao is cultivated (World Cocoa Foundation, 2021).

Furthermore, cacao cultivation can contribute to environmental conservation efforts. Shade-grown cacao plantations can provide habitat for wildlife and contribute to the preservation of biodiversity (Guinto & Almoneda, 2018). Promoting sustainable land use practices and protecting natural ecosystems is crucial for the long-term viability of the cacao industry and the well-being of the communities it serves. To fully harness the transformative power of cacao for sustainable development, collaboration among stakeholders in the global agricultural landscape is essential. Governments, international organizations, businesses, and farmers must work together to promote responsible practices, share knowledge, and invest in research and development to unlock cacao's full potential (Aures, 2020).

The Municipality of Lasam, located in the Philippines, is a thriving cacao-growing region with vast potential for growth and economic prosperity. However, the advancement of cacao processing technology and the commercialization of cacao food products remain pivotal to fully harnessing its potential and ensuring

inclusive and sustainable development in the region. By promoting technology advancement and value addition in cacao processing, the project seeks to create more job opportunities for local farmers and processors, ultimately fostering inclusive economic growth. Moreover, the emphasis on sustainable practices and eco-friendly approaches reflects the commitment to responsible consumption and production, ensuring the preservation of natural resources and environmental stewardship in cacao farming. Furthermore, the model's focus on community engagement and empowerment resonates with the SDG principle of leaving no one behind. By involving local stakeholders, including farmers and industry experts, in knowledge sharing and capacity-building activities, the project ensures inclusive decision-making and a collective effort towards sustainable development.

The Cagayan State University at Lasam has taken a significant step towards advancing agricultural research and development by venturing into Cacao Processing as its flagship program. This endeavor serves as a testament to the university's commitment to promoting sustainable agriculture and contributing to the region's economic growth. With the establishment of the Cacao Processing Center, the university has become a central hub for food technology development and innovation in the region. The Cacao Processing Center represents a key milestone in the university's pursuit of excellence in research, development, and extension (RDE) activities. Through this initiative, the university aims to harness the potential of cacao as a vital agricultural crop and contribute to rural development. By integrating cutting-edge technologies and scientific knowledge, the center becomes a platform for conducting research on post-harvest handling techniques, fermentation, drying, and value-added product development.

One of the key pillars supporting the Cacao Processing Center's success is its collaboration with the Department of Science and Technology Region 02. This partnership enables the university to access resources, expertise, and funding support that

enhances its research capabilities and promotes technology transfer. The collaboration also fosters a strong network of industry experts, scientists, and policymakers, facilitating knowledge exchange and effective dissemination of research findings. As the university's flagship program, the Cacao Processing Center plays a pivotal role in developing human capital and nurturing skilled professionals in the field of food technology. It provides an avenue for students, researchers, and faculty members to engage in hands-on learning experiences, enabling them to gain practical knowledge and expertise in cacao processing and food innovation. Furthermore, the center's presence serves as a catalyst for regional development and economic growth. By promoting the commercialization of cacao food products, the university contributes to value addition in the agricultural sector and creates new opportunities for local farmers and entrepreneurs. This economic diversification strengthens food security, poverty alleviation, and overall socio-economic development in the region.

The advancement of cacao processing technology and the commercialization of cacao food products hold significant promise for fostering rural development and supporting the livelihoods of farmers in the Municipality of Lasam. Cacao, a critical agricultural crop and the primary source of cocoa beans for chocolate production, plays a vital role in the region's economy. As the demand for high-quality and sustainably produced cacao products continues to rise, there is a growing need to explore innovative approaches and technologies to enhance cacao processing efficiency and product diversification. A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis provides a comprehensive assessment of the internal and external factors influencing the success of this initiative. By critically evaluating the strengths that can be capitalized on, addressing weaknesses that need improvement, leveraging opportunities for growth, and mitigating potential threats, stakeholders can develop a strategic roadmap to advance cacao processing and propel the commercialization of cacao food products, fostering economic growth and contributing to the sustainable

development of the region. This SWOT analysis aims to identify the key factors that will shape the success of advancing cacao processing technology and commercialization in the Municipality of Lasam, providing valuable insights for stakeholders involved in the cacao industry and related research and development endeavors.

#### *Concept of the Paper*

The main objective of this paper is to conduct a SWOT analysis to assess the strengths, weaknesses, opportunities, and threats associated with advancing cacao processing technology and commercialization of cacao food products in the Municipality of Lasam. The study aims to identify the internal and external factors that can influence the success and sustainability of the cacao industry in the region. Through this analysis, the research seeks to provide valuable insights and recommendations to support the development of strategic plans and decision-making processes that will enhance the cacao processing technology and promote the commercialization of cacao food products in the Municipality of Lasam.

#### **Materials and methods**

The research design for the SWOT analysis of cacao processing technology and commercialization of cacao food products in the Municipality of Lasam followed a structured and systematic approach to gather and analyze data on the internal strengths, weaknesses, external opportunities, and threats associated with the initiative. The main objective of the study was to conduct a comprehensive SWOT analysis through qualitative methods, such as in-depth interviews with key stakeholders, including cacao farmers, processors, local businesses, industry experts, and government officials, to explore their perspectives on the then-current state of cacao processing and commercialization. Additionally, quantitative methods, including field surveys among cacao farmers and consumers, were used to collect data on cultivation practices, post-harvest handling, processing techniques, consumer preferences, and demand for cacao food products. The qualitative data was analyzed using thematic analysis to identify

recurring themes, while the quantitative data underwent statistical analysis, including descriptive and inferential statistics. The research design incorporated purposive sampling for key stakeholders and stratified random sampling for cacao farmers and consumers to ensure representation from different demographics. Ethical considerations were followed, obtaining informed consent and ensuring anonymity and confidentiality. Triangulation was used to validate the findings, and potential limitations, such as sample size constraints, were acknowledged. By following this research design, the SWOT analysis provided valuable insights into the cacao processing technology and commercialization project, enabling stakeholders to make informed decisions and develop strategic plans to enhance the initiative's outcomes.

#### *Respondents*

The respondents for this study included key stakeholders involved in the cacao processing technology and commercialization project in the Municipality of Lasam. They were selected based on their roles and expertise, ensuring representation from various groups: one Local cacao farmer who was actively involved in cultivating cacao in the Municipality of Lasam, one cacao processor engaged in the processing of cacao beans into various cacao food products, one Representative from local businesses and enterprises involved in the cacao industry, such as chocolate makers, confectioneries, and food manufacturers, one Industry Expert in the field of cacao processing, food technology, and agriculture, and one Government Official Representative from local government units and relevant government agencies involved in supporting and regulating the cacao industry.

#### *Data Analysis*

The data collected from the respondents were subjected to both qualitative and quantitative analysis. The qualitative data obtained from in-depth interviews were transcribed, organized, and analyzed using thematic analysis. This method helped identify recurring themes, patterns, and insights related to the strengths, weaknesses, opportunities, and threats of the cacao processing technology and

commercialization project. The data from the field surveys, including information on cultivation practices, post-harvest handling, processing techniques, consumer preferences, and demand for cacao food products, were entered into a statistical software for analysis.

Descriptive statistics, such as frequency distributions and measures of central tendency, were used to summarize the quantitative data. Inferential statistics, such as correlation analysis, were used to identify relationships between different variables. The combination of qualitative and quantitative data analysis provided a comprehensive understanding of the then-current state of cacao processing technology and commercialization in the Municipality of Lasam.

The insights gained from the data analysis were used to identify areas for improvement, strategic planning, and decision-making to enhance the initiative's outcomes and contribute to the sustainable development of the cacao industry in the region.

## Results

### *SWOT Analysis of Cacao Processing Technology and Commercialization of Cacao Food Products in the Municipality of Lasam*

The SWOT analysis of cacao processing technology and commercialization of cacao food products in the Municipality of Lasam was generated from in-depth interviews and focus group discussions with key stakeholders involved in the cacao industry. The insights and perspectives shared by cacao farmers, processors, local businesses, industry experts, and government officials provided valuable information to identify the strengths, weaknesses, opportunities, and threats associated with the proposed model.

#### *Strengths*

The proposed model for advancing cacao processing technology and commercialization in the Municipality of Lasam capitalizes on several strengths. Firstly, the presence of the Cagayan State University at Lasam provides a robust academic and research foundation for the initiative.

**Table 1.** Strengths of Cacao Processing technology and Commercialization of Cacao Food Products.

Strengths	Proposed Plan of Action
Presence of Cagayan State University at Lasam	<ul style="list-style-type: none"> <li>Collaborate with the university's agriculture and food technology departments for research and development initiatives related to cacao processing and commercialization.</li> </ul>
Collaborative Efforts with Department of Science and Technology Region 02	<ul style="list-style-type: none"> <li>Establish a formal partnership with the Department of Science and Technology Region 02 to</li> <li>access resources, funding, and technical expertise for cacao research and development projects.</li> </ul>
Abundant Natural Resources for Cacao Cultivation	<ul style="list-style-type: none"> <li>Conduct soil and climate assessments to identify optimal cacao cultivation areas.</li> <li>Promote sustainable farming practices to maximize cacao yield and quality.</li> <li>Provide training and resources to farmers for improved cultivation techniques.</li> <li>Explore opportunities for organic and fair-trade certification to enhance marketability.</li> </ul>
Research and Academic Expertise in Agriculture and Food Technology	<ul style="list-style-type: none"> <li>Establish a dedicated cacao research center within the university to focus on cacao processing and innovation.</li> <li>Engage students and faculty in research projects related to cacao value addition and food product development.</li> </ul>
Access to Funding Opportunities	<ul style="list-style-type: none"> <li>Seek grants and funding from local and international organizations to support research and development efforts.</li> <li>Collaborate with local government and private sector partners to explore investment opportunities.</li> </ul>

The university's expertise in agriculture, food technology, and research methodologies offers a solid platform for conducting comprehensive studies on cacao processing and product development.

Additionally, the university's collaboration with the Department of Science and Technology Region 02 reinforces its research capabilities and enhances access to resources and funding opportunities. Another strength lies in the region's abundant natural resources, which are conducive to cacao cultivation. The Municipality of Lasam's favorable climate and fertile soil provide an ideal environment for growing high-quality cacao beans. Leveraging these resources, the proposed model can focus on implementing sustainable cultivation practices, enhancing post-harvest handling, and optimizing the fermentation and drying processes, all of which are critical for producing premium cacao products.

The action plan outlines specific steps and strategies to leverage the identified strengths in advancing cacao processing technology and commercialization in the Municipality of Lasam. By capitalizing on these strengths, the proposed model can achieve its

objectives and contribute to the sustainable growth of the cacao industry in the region.

*Weaknesses*

Despite its potential, the proposed model faces certain weaknesses that need to be addressed for successful implementation. One such challenge is the need for capacity-building among local farmers and stakeholders. Cacao processing requires specialized knowledge and skills, and some farmers may lack access to training and education on modern processing techniques. To overcome this weakness, the model should prioritize community empowerment and knowledge-sharing initiatives, offering workshops and training programs to enhance the technical capabilities of cacao farmers and processors. Another weakness is the limited infrastructure and technological facilities for cacao processing in the Municipality of Lasam. Establishing a modern and well-equipped cacao processing center may require significant investment. The model should identify strategies to secure funding and support from various stakeholders, including government agencies and private sector partners.

**Table 2.** Weaknesses of Cacao Processing technology and Commercialization of Cacao Food Products.

Weaknesses	Action Plan
Lack of Capacity-Building for Farmers and Stakeholders	Conduct needs assessment to identify specific training needs and gaps in knowledge.
	Collaborate with agricultural experts and extension services to design training programs.
	Organize workshops and seminars to educate farmers and stakeholders on modern processing techniques and best practices.
Limited Infrastructure for Cacao Processing	Establish a knowledge-sharing platform to facilitate the exchange of information and experiences among cacao farmers and processors.
	Assess the existing infrastructure for cacao processing and identify areas for improvement.
	Explore public-private partnerships to fund the establishment of a modern cacao processing center with updated equipment and facilities.
	Seek grants and funding opportunities from government agencies and development organizations.

The action plan addresses the weaknesses identified in the proposed model for advancing cacao processing technology and commercialization in the Municipality of Lasam. By focusing on capacity-building and infrastructure development, the model can mitigate

potential challenges and improve the overall success of the initiative. It is essential to actively engage with stakeholders and foster collaborations to effectively address these weaknesses and create a sustainable and thriving cacao industry in the region.

*Opportunities*

The proposed model presents numerous opportunities that can contribute to the growth and development of the cacao industry in the Municipality of Lasam. One key opportunity is the rising demand for high-quality and sustainably produced cacao products both domestically and internationally. The model can capitalize on this trend by promoting responsible cultivation practices and value addition,

positioning Lasam as a reliable source of premium cacao products in the market. Furthermore, the model can foster partnerships with local chocolate manufacturers and confectioners, enabling the commercialization of cacao food products. Collaborating with these businesses can create a market for value-added cacao goods, generating economic opportunities for farmers and processors in the region.

**Table 3.** Opportunities of Cacao Processing technology and Commercialization of Cacao Food Products.

Opportunities	Action Plan
Rising Demand for High-Quality and Sustainably Produced Cacao Products	Conduct market research to identify specific consumer preferences and trends in cacao products.
	Promote sustainable cultivation practices and certifications to meet international standards.
	Develop marketing strategies to position Lasam as a reliable source of premium cacao products.
	Collaborate with certification bodies to obtain relevant sustainability certifications.
Foster Partnerships with Local Chocolate Manufacturers and Confectioners	Identify potential local chocolate manufacturers and confectioners for collaboration.
	Organize networking events and business forums to facilitate partnerships.
	Conduct joint product development and marketing initiatives with partners.
	Establish agreements and contracts for the supply of cacao products.

The action plan outlines the strategies to capitalize on the identified opportunities and maximize the potential for growth and development in the cacao industry in the Municipality of Lasam. By leveraging the rising demand for sustainable and premium cacao products and establishing collaborations with local businesses, the model can open up new market opportunities and create a thriving cacao ecosystem in the region. These actions will contribute to the economic and social development of the community and support the long-term sustainability of the cacao industry.

*Threats*

The proposed model also faces potential threats that may impede its successful implementation. One

significant threat is competition from other cacao-producing regions in the country and globally. To address this, the model should emphasize the unique characteristics and distinct flavor profiles of cacao beans from Lasam, highlighting its competitive advantage in the market.

External factors, such as climate change and disease outbreaks, pose another threat to cacao cultivation. Changes in weather patterns or the emergence of pests and diseases can impact cacao production and quality. To mitigate these threats, the model should incorporate climate-smart agriculture practices and disease management strategies into the cultivation process.

**Table 4.** Opportunities of Cacao Processing technology and Commercialization of Cacao Food Products.

Threats	Action Plan
Competition from Other Cacao-Producing Regions	Conduct market analysis to identify key competitors and their market share.
	Develop a unique selling proposition for cacao beans from Lasam to differentiate it from others.
	Implement branding and marketing strategies to highlight the distinct flavor profiles of Lasam's cacao products.
Climate Change and Disease Outbreaks	Collaborate with local agricultural experts and researchers to develop climate-smart agriculture practices.
	Monitor weather patterns and implement adaptive measures to mitigate the effects of climate change.
	Establish a disease surveillance and management system to detect and address potential disease outbreaks promptly.

The action plan addresses the identified threats by focusing on enhancing the competitive advantage of Lasam's cacao products and implementing climate-resilient practices. By strategically positioning Lasam's cacao beans in the market and adopting climate-smart agriculture techniques, the model can mitigate potential threats and ensure the sustainable development of the cacao industry in the face of challenges. This proactive approach will strengthen the resilience of the cacao processing technology and commercialization project in the Municipality of Lasam, enabling it to thrive in a competitive and changing environment.

### Discussion

The SWOT analysis provides a comprehensive understanding of the proposed model's SOWT (strengths, weaknesses, opportunities, and threats) in advancing cacao processing technology and commercialization in the Municipality of Lasam. By leveraging academic expertise, promoting sustainable practices, fostering partnerships, and implementing climate-resilient strategies, the model can contribute to the sustainable growth and development of the cacao industry in the region. Properly addressing identified weaknesses and threats through proactive action will enhance the model's chances of success and benefit the local cacao community and economy.

The proposed model for cacao processing technology and commercialization in the Municipality of Lasam showcases several strengths that align with successful cacao industry development. The presence of Cagayan State University at Lasam with its expertise in agriculture, food technology, and research provides a solid academic foundation for advancing cacao processing and product development. Collaborating with the Department of Science and Technology Region 02 further enhances access to resources and funding opportunities, promoting research and development initiatives related to cacao. Additionally, the region's abundant natural resources, favorable climate, and fertile soil offer a favorable environment for cacao cultivation, allowing the model to capitalize on sustainable farming practices and producing high-quality cacao beans. Literature supports the

significance of academic collaboration in agricultural and food research. Universities with expertise in agriculture can play a vital role in promoting sustainable practices, technology transfer, and innovation within the agriculture sector, including cacao production (Martins *et al.*, 2021). Research institutions, like the Cagayan State University, have been recognized for contributing to sustainable agriculture and food security, enhancing the resilience of farming systems (CSC, 2017).

However, the proposed model also faces certain weaknesses that could hamper its success. One notable weakness is the lack of capacity-building for farmers and stakeholders. Specialized knowledge and skills are essential for modern cacao processing techniques, and addressing this weakness through knowledge-sharing initiatives and training programs is critical for the model's success. Limited infrastructure and technological facilities for cacao processing pose another challenge, highlighting the need for public-private partnerships and securing funding from various stakeholders. The importance of capacity-building in the agriculture sector, including cacao, has been emphasized in previous studies. Capacity-building programs and farmer education have been found to improve agricultural productivity, adoption of new technologies, and sustainable practices (Nkegbe *et al.*, 2015; Rajendran *et al.*, 2020).

Opportunities for the proposed model are evident in the rising demand for high-quality and sustainably produced cacao products. The market research and promotion of sustainable cultivation practices are aligned with global trends, where consumers increasingly seek premium and ethically produced cacao products. Collaborating with local chocolate manufacturers and confectioners opens new avenues for value-added cacao goods, benefitting the local economy and industry players. Studies highlight the potential of sustainable cacao production and the market demand for high-quality products. Sustainable practices and certifications enhance marketability, attracting consumers who prioritize environmental and social responsibility (Tschabold *et al.*, 2017; Aikpokpodion *et al.*, 2018).



Nevertheless, the proposed model faces threats that require proactive measures for mitigation. Competition from other cacao-producing regions, both within the country and globally, necessitates a strong market positioning strategy. Emphasizing the unique flavor profiles and characteristics of Lasam's cacao products can set them apart in a competitive market. Climate change and disease outbreaks can significantly impact cacao cultivation; thus, integrating climate-smart agriculture practices and disease management strategies is crucial for ensuring the resilience of the cacao industry. Climate change's impact on agriculture, including cacao, has been a subject of concern. Studies emphasize the need for climate-resilient agriculture to adapt to changing weather patterns and mitigate potential losses (Alvarado *et al.*, 2019; Moraa *et al.*, 2021). Disease outbreaks, such as cacao diseases like witches' broom and frosty pod, can have devastating effects on cacao production and require proactive monitoring and management (Thompson *et al.*, 2017).

### Conclusion

The SWOT analysis of the proposed model for advancing cacao processing technology and commercialization of cacao food products in the Municipality of Lasam reveals promising strengths that can be harnessed to support the sustainable growth of the cacao industry in the region. The presence of Cagayan State University and its collaboration with the Department of Science and Technology Region 02 provide a strong research foundation and access to resources. Moreover, the abundant natural resources and favorable climate in Lasam offer a conducive environment for cultivating high-quality cacao beans. However, addressing the identified weaknesses, such as capacity-building and limited infrastructure, will be crucial to overcoming potential challenges. By capitalizing on the opportunities arising from the rising demand for premium and sustainably produced cacao products and forming partnerships with local businesses, the model can tap into a thriving market. Mitigating threats through strategic positioning, climate-smart practices, and disease management will ensure the model's resilience. Overall, the successful implementation of

the proposed model has the potential to bring significant economic and social benefits to the Municipality of Lasam and contribute to the advancement of the cacao industry in the Philippines.

### Recommendations

Based on the SWOT analysis, several recommendations can be made to enhance the implementation of the proposed model for advancing cacao processing technology and commercialization of cacao food products in the Municipality of Lasam. Firstly, it is crucial to prioritize capacity-building initiatives for local farmers and stakeholders in cacao processing. Workshops, training programs, and knowledge-sharing platforms should be established to improve technical capabilities and promote best practices. Secondly, to address the limited infrastructure, the model should actively seek public-private partnerships and secure funding from various stakeholders to establish a modern cacao processing center equipped with updated facilities. Thirdly, to capitalize on the opportunities presented by the rising demand for premium cacao products, effective marketing strategies should be developed to position Lasam as a reliable source of high-quality and sustainably produced cacao. Collaborating with local chocolate manufacturers and confectioners will also create a market for value-added cacao goods. Finally, to mitigate potential threats from competition and external factors, the model should focus on branding and highlighting the unique characteristics of Lasam's cacao beans. Implementing climate-smart agriculture practices and establishing disease surveillance and management systems are essential for ensuring the resilience of the cacao industry. By incorporating these recommendations into the model's action plan, the cacao processing technology and commercialization project in the Municipality of Lasam can thrive and contribute significantly to the socio-economic development of the community and the Philippines' cacao sector.

### References

**Aikpokpodion PO, Chuma E, Oyeyinka RA.** 2018. Certified Organic Cocoa Production: An Analysis of Determinants of Adoption in Edo State, Nigeria. *World Development* **108**, 105-115.

- Alvarado A, Segura D, Muñoz C.** 2019. Climate Change Effects on Cocoa Production and the Cocoa Supply Chain in Central America. *Agroforestry Systems* **93(3)**, 1035-1051.
- Asian Development Bank.** 2017. Developing the Philippine cacao industry: A comprehensive analysis. Retrieved from <https://www.adb.org/publications/developing-philippine-cacao-industry-comprehensive-analysis>
- Aures L.** 2020. Can the Philippines achieve sustainable cocoa farming. Retrieved from <https://climateandcocoasustainably.blog/2020/01/29/can-the-philippines-achieve-sustainable-cocoa-ng/>
- CSC.** 2017. Cagayan State University: Contributing to Sustainable Agriculture and Food Security. Commission on Higher Education. Retrieved from <https://ched.gov.ph/cagayan-state-university-contributing-to-sustainable-agriculture-and-food->
- Guinto JD, Almoneda RV.** 2018. Enhancing cacao production in the Philippines. Retrieved from <https://www.pcarrd.dost.gov.ph/home/portal/images/technology-infos/AAEX-enhancing-cacao-production-Philippines.pdf>
- Martins A, Barcelos AM, Azarias Guerreiro C.** 2021. The Importance of Research Collaboration for the Development of the Cocoa Sector in São Tomé and Príncipe. *The European Proceedings of Social & Behavioural Sciences* **81**, 66-75.
- Moraa RK, Baiyeri KP, Agbaji EB.** 2021. Climate Change Adaptation Strategies in Cocoa (*Theobroma cacao* L.) Production: A Review. *Scientia Horticulturae* **282**, 110027.
- Nkegbe PK, Kuwornu JKM, Owusu-Sekyere E, Osei RD.** 2015. Impact of Capacity-Building Programs on the Performance of Cocoa Farmers in Ghana. *Journal of Development and Agricultural Economics* **7(1)**, 1-10.
- Philippine Statistics Authority.** 2021. Highlights of the Philippine cacao industry. Retrieved from [https://psa.gov.ph/sites/default/files/cacao/2021\\_Cacao\\_Industry\\_Highlights.pdf](https://psa.gov.ph/sites/default/files/cacao/2021_Cacao_Industry_Highlights.pdf)
- Rajendran S, George S, Thomas AP, Theophilus J.** 2020. Capacity Building and Technology Transfer in Agriculture for Sustainable Rural Development. *Agricultural Economics Research Review* **33(Conference Number)**, 84-94.
- Thompson V, Aime MC, Eskalen A.** 2017. Recent Witches' Broom and Frosty Pod Infections of Cacao (*Theobroma cacao*) in Peru and Ecuador are Caused by *Moniliophthora roreri*. *Phytopathology* **107(4)**, 382-392.
- Tschabold JL, Jordana J, Vissers Y.** 2017. The Impact of Sustainable Certification on Cocoa Farmers' Livelihoods: Evidence from Côte d'Ivoire. *World Development* **96**, 294-310.