

Food Product Development Lab

Sustainable Cocoa Value Chain in the Eyes of Indigenous Wisdom – A Case Study

C. IFEH¹, H. AGU², F. SANTOS³ and W-Y. KUO¹

- 1 Sustainable Food Systems, Department of Food Systems, Nutrition, and Kinesiology, Montana State University, Bozeman, MT, USA
- 2 Department of Food Science and Technology, Nnamdi Azikiwe University, Awka, Nigeria
- 3 Department of Food, Bioprocessing and Nutrition Sciences, North Carolina State University, Raleigh, USA

Contact Information: chidimma.ifeh@montana.edu wanyuan.kuo@montana.edu



ABSTRACT

Achieving a sustainable value chain requires collaborative efforts between cocoa farmers, chocolatiers, and chocolate companies, integrating indigenous wisdom with modern practices. This study explores the challenges and interests of cocoa farmers and chocolatiers in achieving a sustainable cocoa bean-to-bar practice, focusing on smallholder cocoa farmers and chocolate companies in Ondo, Nigeria, and chocolatiers in Montana, USA. The cocoa farmers, chocolatiers, and chocolate companies were interviewed using semistructured questionnaires. Farmers in Nigeria highlighted the seasonal timing of cocoa harvests, planting practices, fermentation processes, challenges in farming, government support, and the significance of cocoa farming to their families and communities. Challenges included physical strength requirements, climate impacts, disease management, and the need for more interest among youth in cocoa farming. Chocolatiers in the USA discussed company backgrounds, cocoa sourcing, production processes, challenges, innovation potentials, and consumer feedback. Challenges included financial constraints, equipment reliability issues, and the need for market adaptation. The study sheds light on the intricate dynamics of the cocoa value chain from the perspectives of indigenous knowledge from farmers and chocolatiers.

BACKGROUND

- Cocoa beans are seeds from the tree Theobroma cacao L, native to the Amazon and grown in tropical rainforests in Central and South America [1].
- Although cocoa originated in the Americas, 70% is grown in West Africa [2].













Figure 2: Fresh and dried cocoa beans

Farmers Chocolatiers Chocolate companies Process beans gotten directly from

- Cocoa farming is vital in Ondo State, akin to crude oil
- Farmers have deep roots and indigenous wisdom
- New cocoa varieties reduce wait time Some yield pods in 2-3 years, boosting
- income > Research drives efficiency enhancing
- the farm Offers traceable
 - and premium chocolate
 - Commits to fair pricing and local sourcing supporting
- preferences Innovation and
- cocoa production global collaboration
- Promotes eco-friendly packaging practices Collaborates locally and aims for
- community growth > Focuses on dark chocolate bars
 - Emphasizes meticulous process and taste variations
 - Sources organic cacao and plans for repurposing cocoa shells

> Knowledge of cocoa farming and handling Status and challenges

METHODS & RESULTS

> History Two Chocolate Semistructured Companies interview (Nigeria) **Categories - 15 questions** questions Background Processing and innovation Two Chocolatiers Sustainability

Categories - 25 questions

Figure 3: Interview question categories and research participants

Growth and challenges





Byproducts usage

Four Farmers

(Nigeria)

(USA)

- Pig feed
- Shoe polish Black soap
- Mosquito coils

Harvesting

Practices

Farmers

Adoption of new

cocoa variety

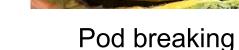
Box and heap

fermentation

Income diversity

Cocoa pod upcycling







Box fermentation

Figure 5: Farmers' cacao pods to cocoa beans process

Chocolate companies

Cacao pods

- Direct cocoa sourcing Premium chocolate
- production
- Milk and dark chocolate

Sorting

Cocoa shells upcycling

Chocolatiers

Cocoa shells

- Diverse cocoa origin Varied cocoa percentage
- > Craft chocolate production

Roasting

Figure 4: Byproducts from cocoa beans & chocolate

Composting cocoa shells

Chocolate companies

- ✓ Fruit infused chocolate
- ✓ New product development ✓ Innovation

Winnowing

Figure 6: Chocolatiers and chocolate companies' cocoa beans to chocolate bars process

& customization ✓ Expansion and export

Chocolatiers

✓ Quality chocolate desire ✓ Specialize in dark chocolate

Refining

- ✓ Cocoa shell tea
- ✓ Eco-friendly packaging

Chocolate companies

- Power supply
- Security

Interests

Farmers

✓ Community

practices

✓ Economic

development

empowerment

✓ Preserving heritage

✓ Sustainable farming

- Cost of equipment
- Financial constraints

Chocolatiers

Financial constraints

Sun drying

Challenges

Farmers

Inadequate government

Poor road conditions

Lack of clean drinking

Lack of youth interest

Market Pricing

support

- Faulty equipment
- Commercial space
- Manual production



Tempering

Molding

CONCLUSIONS

This research project reveals cocoa and chocolate's deep significance in Ondo and Montana, USA. It serves as the economic backbone, supporting livelihoods and generating export income. The sustainability of this traditional practice is further complicated by the reluctance of educated youth to continue cocoa farming, inadequate government support, and the influence of modern trends.

Table 1: Key sustainability themes identified

Theme	Farmers	Chocolate companies	Chocolatiers
Practices	Cocoa pod upcycling	Premium chocolate production	Diverse cocoa origin
Interests	Preserving cultural heritage	Expansion and export	Eco- friendly packaging
Challenges	Recruiting younger generations Cocoa pricing	Financial constraints Expensive and faulty equipment	

The findings contribute to the ongoing discourse on sustainable cocoa production and its implications for local communities and global chocolate industries. Further research and policy interventions are warranted to promote global inclusive and environmentally friendly cocoa value chains.

ACKNOWLEDGEMENTS

This research was fully funded by Mars Wrigley. The Montana State University College of Education, Health, and Human Development funded meeting travels partly. The authors are responsible for this publication's content, which does not reflect the official views of any entities indicated above. We also acknowledge the farmers and chocolate companies in Nigeria and the chocolatiers in Montana, USA.

REFERENCES

[1] Caligiani, A., Marseglia, A., & Palla, G. (2016). Cocoa: Production, Chemistry, and Use. In Encyclopedia of Food and Health (pp. 185-190). Elsevier. https://doi.org/10.1016/B978-0-12-384947-2.00177-X [2] ICCO. (2023, February 28). Global cocoa bean production from 2020/21 to 2022/23, by country (in 1,000 metric tons) [Graph]. Statista. https://www.statista.com/statistics/263855/cocoa-bean-productionworldwide-by-region/