



Bean to Bar - Craft Chocolate: The need for education, training and qualifications for an emerging and growing industry

Richard Scarf

Victorian Skills Authority Fellowship, 2024

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First Published 2024

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Printed by MDM Copy Centre

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ISBN: 978-1-923027-75-6

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01

Acknowledgements

The Awarding Bodies

The Fellow sincerely thanks the Victorian Skills Authority (VSA) for providing funding support for the ISS Institute and for this Fellowship.

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Fellow's Acknowledgements

- International Specialised Skills (ISS) Institute for making the Fellowship available.
- Victorian Skills Authority (VSA) for sponsoring the fellowship.

Australia

John Grisold	Chocolatier Australia
Thibault Fregoni	The Cocoa Provider
Debb Makin	Ratio Cacao Roasters

William Angliss Institute (WAI - Employer)

Angela Tsimiklis	Project coordinator, Challenge-based learning
Chris Harris	Director of Education
Melanie Williams	Associate Dean (Scholarship)
Sandi Homer	Manager VET
Bhaskar Adeeb	Acting Program Leader - Patisserie and Bakery
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Canada

Pam Williams	Ecole Chocolate, Vancouver
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Costa Rica

George Soriano	Sibö Chocolate, Costa Rica
Julio Fernández Amón	Sibö Chocolate, Costa Rica
Dr Wilbert Phillips-Mora	Centre for Tropical Agricultural Research and Higher Education (CATIE), Costa Rica

United States

Dylan Butterbaugh	Manoa Chocolate, Hawaii
Daniel O'Doherty	Cacao Services, Hawaii
Max Breen	Cacao Services, Hawaii

Italy

Stefano Porrino	SELMi SRL Italy, Chocolate machinery
SELMi Manufacturing	SELMi SRL Italy, Chocolate machinery

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Executive Summary of Fellowship

Background

The purpose of this Fellowship is to conduct an in-depth investigation into the entire cacao production process, starting from cultivation and harvesting through to the production and crafting of chocolate. The Fellow will explore each stage of the cacao supply chain, with a particular focus on the importance of biodiversity, agroforestry, and sustainability. Best practices within the industry will be examined, along with the feasibility and impact of organic certification. Additionally, the ethical considerations surrounding the supply chain will be a key area of investigation.

A further objective of the Fellowship is to assess its relevance to the Bean to Bar Craft Chocolate industry in Australia. This will include evaluating the current needs for education, qualifications, and support within the sector, as well as identifying opportunities for further development.

The Fellow identified significant gaps in the Victorian Vocational Education and Training (VET) sector concerning the Bean to Bar craft chocolate industry. There is currently no formal education or training available on the subject, and VET educators lack the necessary skills and knowledge in this area. Furthermore, the Fellow noted that Bean to Bar craft chocolate is not included in the

Certificate IV in Patisserie qualification, despite its status as an emerging and rapidly growing industry in Australia and worldwide.

For individuals seeking to expand their expertise in Bean to Bar craft chocolate, the only current avenues for learning are through online resources, gaining experience by working for existing craft chocolate makers or venturing overseas.

The AgriFutures report, Australian Cocoa Strategic RD&E Plan (2022-2027), highlights cocoa as an emerging industry. The plan focuses on modernising and expanding cocoa production and post-harvest processing. Given Melbourne's reputation as Australia's culinary capital and Victoria's status as the leading state for education, this presents a unique opportunity to develop and promote education in Bean to Bar craft chocolate within the VET sector.

Melbourne is already recognised globally for its speciality coffee scene, and there is an opportunity to elevate Bean to Bar craft chocolate to a similar level of prominence. By leveraging the state's educational strengths, Victoria could play a leading role in shaping the future of the Bean to Bar craft chocolate industry.

The Fellow, with over 40 years of experience in the hospitality industry and education, has observed the evolving demands for specialised skills within the sector. Driven by a passion for chocolate and a desire to enhance personal knowledge and expertise, the Fellow sought to explore educational opportunities in the emerging Bean to Bar craft chocolate industry. However, it became apparent that no formal education or qualification is currently available in this area.

Recognising Bean to Bar chocolate's rapid growth and potential, the Fellow aims to lead efforts in establishing an educational pathway that will support the industry's development, sustainability, and evolution. By addressing this gap in vocational education, the Fellow seeks to ensure that future generations of chocolate makers are equipped with the specialist skills required to meet the demands of this growing industry.

Countries visited

The Fellow undertook study visits to three countries—Costa Rica, Hawaii, and Italy—each selected for its unique contributions to the cacao and chocolate industries.

Costa Rica: Costa Rica was chosen for its world-renowned research centre, CATIE (Tropical Agricultural Research and Higher Education Centre), which has decades of expertise in cacao research. CATIE is home to a germplasm bank with over 1,235 cacao varieties, making it a global leader in the study of cacao genetics, cloning, and disease resistance. Additionally, CATIE runs the oldest International Postgraduate Program in Agriculture and Natural Resources in Latin America. The Fellow's visit focused on sustainability, agroforestry, and the genetic improvement of cacao, all while emphasising biodiversity protection.

Hawaii: Hawaii, one of the few first-world countries that cultivates cacao, provided the Fellow with hands-on experience in both farming and chocolate production. The Fellow worked at Kamanui Estate, one of the most genetically diverse cacao orchards globally, learning critical aspects of planting, harvesting, fermenting, and drying cacao.

Additionally, the Fellow gained first-hand experience in a state-of-the-art chocolate factory, learning the entire chocolate-making process, from bean to bar.

Hawaii was an excellent model for Australia, as both are first-world countries with similar labour laws and minimum wages. The Fellow explored how Hawaii successfully markets and sells premium chocolate, which costs significantly more to produce than mass-produced chocolate made from commodity cacao from developing countries. Hawaii also integrates modern farming practices and technology to ensure consistent production while focusing on growing high-yielding, fine-flavour cacao varieties. This combination of technology and sustainability positions Hawaii at the forefront of the industry.

Italy: Italy was selected for its reputation as a world leader in chocolate-making equipment. The Fellow gained a deep understanding of the various types of equipment used in chocolate production, learning the advantages and disadvantages of each. Additionally, the Fellow honed skills in the craft of chocolate-making, mastering processes such as roasting, winnowing, pre-grinding, refining, conching, tempering, and moulding. This visit completed the Fellow's comprehensive understanding of the entire cacao-to-chocolate process.

These international visits provided the Fellow with valuable insights into sustainable cacao farming, modern production methods, and Bean to Bar chocolate-making craft, offering a foundation for future educational initiatives in Australia.

Fellowship learnings

The Fellowship research draws attention to several important insights and learnings influencing the Bean to Bar craft chocolate industry:

Emerging Industry Growth:

- In 2016, there were 12 Bean to Bar chocolate makers in Australia.
- By 2023, this number had grown to 35, with projections suggesting the industry could reach over 100 makers by 2030.

Lack of Formal Education:

- No formal education or qualifications related to Bean to Bar chocolate currently exist in Victoria or Australia.
- VET educators lack the necessary skills and knowledge in this field, further highlighting the need for specialised training.

Absence of Short Courses:

- There are no short courses or structured training programs available to support the development of skills in the Bean to Bar chocolate industry.

Limited Industry Support:

- The industry lacks the necessary support structures to foster its growth, leaving potential business opportunities untapped.
- Significant business opportunities in the suitable locations could also lead to expanded employment prospects in the industry.
- There is a growing trend of consumers demanding greater transparency and information regarding ethically sourced and sustainable products.

Sustainability and Ethical Supply Chain:

- Bean to Bar chocolate strongly emphasises sustainability and ethical practices in the supply chain, ensuring farmers receive a living income and supporting the wider farming community for mutual prosperity.
- These findings reiterate the potential for developing education, training, and support for this rapidly growing industry, as well as the opportunity to align with consumer demand for ethical and sustainable products.

The Fellow's research concluded that there is a significant opportunity to develop a specialised educational program in Bean to Bar craft chocolate, driven by the absence of formal training options in Australia. With the industry emerging and experiencing rapid growth, there is substantial potential to offer such a program in Australia and across the Asia-Pacific region.

The strong interest demonstrated at the recent inaugural 'ChocFest' Bean to Bar chocolate festival further highlights the growing demand for education and skill development in this area.

Throughout the research period, the Fellow consulted with numerous industry and educational professionals, all expressing support for the initiative. This collective backing reinforces the need for establishing an educational pathway in Australia, which would enhance skill development and position Australia as a leader in Bean to Bar chocolate education.

Bredan Hill – VET Educator, Gordon TAFE

"Your ISSI fellowship sounds fantastic, and very much on point with the developments in the industry, well done and thank you for your passion and desire to learn more about this essential factor of the industry and progress its development through training opportunities for future teachers and students."

Further comments can be found in Appendix 1.

Personal, professional, and sectoral impact

Personal and Professional:

The Fellowship provided the Fellow with the opportunity to engage directly with renowned international practitioners and experts in the fields of cacao farming, craft chocolate production, and chocolate-making equipment. This hands-on experience offered the Fellow valuable insights into the industry, from the foundational aspects of cacao cultivation to the technical processes of chocolate-making.

Through these engagements, the Fellow was able to establish professional relationships that will be invaluable in facilitating future research and ongoing involvement in the industry. Additionally, the Fellow initiated a dialogue with stakeholders, paving the way for a scholarship program between William Angliss Institute in Australia and SELMI in Italy, further enriching the educational opportunities available to students between William Angliss Institute and SELMI Italy.

Sectoral Impact:

The Fellow's research and outcomes are expected to significantly advance both the Bean to Bar industry and the VET sector. By equipping the industry with advanced skills and knowledge, this initiative will drive the need for high-quality education and training in Australia, supporting the growth of this emerging sector. Australia is uniquely positioned to learn from established international practices and build a robust educational framework that will benefit the industry and future professionals.

Considerations

The Fellowship stands out with its unique approach of integrating historical and traditional insights into the development of skills with international relevance. This distinctive feature will lead to the creation of a robust training program tailored to the Australian vocational sector, benefiting vocational educators, industry professionals, and the wider community.

The Fellowship is designed to meet the specific needs of the vocational education sector and the chocolate industry. Its long-term impact will include the establishment of a Bean to Bar chocolate training program and the recognition of specialised professional skills in chocolate craftsmanship within Australia. These benefits will directly contribute to the advancement of the vocational education sector and support the growing demand for expertise in the Bean to Bar craft chocolate industry.

Key Benefits of the Fellowship:

- **Acceleration of Industry Learning:** The Fellowship will fast-track the development of advanced skills and knowledge for VET educators and the chocolate industry, positioning them to meet emerging market demands.
- **Support for Industry Growth:** The Fellowship will help cultivate talent and support the continued growth of the Bean to Bar craft chocolate industry in Australia by offering education and training through short courses and micro-credentials.
- **Curriculum Enhancement:** The Fellowship will embed crucial skills and knowledge into the existing Certificate IV in Patisserie qualification, ensuring vocational students are equipped with specialised expertise in chocolate craftsmanship.

Upcoming Presentations:

- Victorian Skills Authority (VSA), July 2024
- October VET 2024
- William Angliss Institute Applied Research Forum
- Professional Development Workshop for VET Educators

These platforms will provide opportunities for the Fellow to share the research outcomes and promote the development of training initiatives that will benefit the Australian VET sector and the broader industry.

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Fellowship Background

Fellowship context

The Fellowship focuses on investigating the latest agricultural methods and best practices in cacao farming, with particular attention to ethical considerations within the supply chain. This area is experiencing growing interest, which has resulted in a notable gap in education and training. To gain a comprehensive understanding of the entire cacao production process, four cacao farms were visited, providing insights into all stages of production prior to reaching the craft chocolate maker.

The research encompasses several key elements, including terroir, sustainability, agroforestry, and biodiversity. It covers the cultivation processes from seed to tree, as well as the critical steps of harvesting, fermenting, and drying. There is an increasing focus on fermentation and its impact on the final flavour profile and nuances of the chocolate. Additionally, the most effective methods for roasting and processing cacao beans into chocolate will be explored to highlight the unique characteristics of the beans, thereby completing the cycle from seed to bar.

As Bean to Bar craft chocolate continues to emerge as a growing industry, there is currently no formal education or qualifications available in Victoria or Australia.

Upon completing the Fellowship research, the identified knowledge gap will be addressed through the development of a comprehensive Bean to Bar chocolate course at William Angliss Institute. This

will include a micro-credential, and the Fellow will advocate for the incorporation of these findings into the Certificate IV in Patisserie qualification.

Fellowship methodology

The methodology for the Fellowship involved comprehensive field research across three international destinations: Costa Rica, Hawaii, and Italy. This approach aimed to gain an in-depth understanding of cacao cultivation and chocolate production, encompassing both theoretical knowledge and practical experience.

1. Costa Rica:

Research Centre Visit: The Fellow began by visiting the Centre for Tropical Agricultural Research and Higher Education (CATIE), a leading research institution recognised for its work in cacao. Here, the Fellow focused on learning about cacao genetics, propagation, and grafting techniques. The visit included discussions on the significance of the germplasm bank, which houses over 1,235 cacao varieties.

Farm Visits: The Fellow conducted site visits to four cacao farms—ranging from small to large operations, including an indigenous farm—to observe their methodologies and processes from germination through to drying. These visits provided insight into different farming practices and their impacts on cacao quality.

Chocolate Factory Tour: The Fellow also toured a medium-sized chocolate factory that processes approximately 250,000 kg of chocolate annually, gaining a practical understanding of the production processes involved.

2. Hawaii:

Hands-On Experience: At Kamananui Estate, the Fellow engaged in hands-on activities such as planting, harvesting, fermenting, and drying cacao. This immersive experience highlighted the significance of each stage in influencing the final flavour and nuances of the chocolate, with a particular focus on the preservation of heirloom cacao varieties.

Chocolate Production Participation: The Fellow visited the Manoa chocolate factory, where he participated in making chocolate from scratch. This involvement allowed him to explore the processes of chocolate production, including equipment selection, flavour showcasing, and the balance between quantity and quality in creating a sustainable business model.

Industry Conference: While in Hawaii, the Fellow attended the annual Hawaiian Cacao Conference, where he gathered insights on industry promotion strategies and the challenges faced by first-world countries in competing with large multinationals sourcing commodity cacao from developing nations.

3. Italy:

Equipment Manufacturer Visit: The Fellowship concluded with a visit to SELMI, a renowned chocolate equipment manufacturer. The Fellow learned about the equipment used in Bean to Bar craft chocolate production, focusing on selection criteria and the efficiencies of various machines employed in the chocolate-making process.

Overall, this multi-faceted approach enabled the Fellow to gather extensive knowledge and practical insights from diverse contexts within the cacao and chocolate industries. The findings from these international experiences will inform the development of educational programs and initiatives

aimed at enhancing skills within the Australian vocational sector.

Fellowship period

The fellowship period is over one year and started in October 2023. The Fellow plans to be completed by October 2024 – 12 months.

Fellow's biography

Name: Richard Scarf

Current employment: William Angliss Institute of TAFE – Teacher, Patisserie

Qualifications:

- Level 1 Certificate in Chocolate tasting, 2024
- Level 2 Certificate in Chocolate tasting, 2024
- Diploma of Vocational Education and Training, Box Hill Institute 2015
- Diploma of Training Design and Development, Box Hill Institute 2015
- Certificate IV in Training and Assessment 2005
- Certificate IV in Hospitality (Patisserie) 2012
- London City & Guilds 706/3 Advanced Pastry
- London City & Guilds 706/3 Pastry
- London City & Guilds 706/1 & 706/2 Cookery for the catering industry

Memberships: Fine Chocolate Industry Association (FCIA)



Biography

Richard Scarf is a highly skilled, motivated and dedicated professional and well respected in his field with over 40 years of experience across four countries, New Zealand, United Kingdom, Switzerland and Australia.

Richard has worked across a variety of establishments including five-star hotels and manufacturing before owning and operating his own business.

In his current role as Patisserie Teacher at William Angliss Institute in Melbourne, Richard enjoys teaching the final stage in the Certificate IV in Patisserie qualification, namely cake decorating, sugar, showpieces and his passion - chocolate.

Richard has held various senior roles in kitchen management including Executive Pastry Chef at the Grand Hyatt Melbourne, Head Chocolatier at Chocolatier Australia, Melbourne, Pastry Chef Sheraton Park Tower London as well as running his own business in Melbourne.

Richard has won numerous awards throughout his career, many of which involve chocolate, the more notable ones are:

- Gold Medal – Culinary Olympics, Frankfurt
- Gold Medal – Hotelympia London
- Gold Medal – Food Service Melbourne (two consecutive years)
- Chef of the Year – Food Service Melbourne
- Guinness Book of World Records – World's tallest cake, Melbourne

Acronyms

AVETRA	Australian Vocational Educational and Training Research Association
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Centre for Tropical Agricultural Research and Higher Education)
FCIA	Fine Chocolate Industry Association
HCP	Heirloom Cacao Preservation
ICCT	International Institute of Chocolate and Cacao Tasting
ISSI	International Specialised Skills Institute
VSA	Victorian Skills Authority
WAI	William Angliss Institute
WCF	World Cocoa Foundation

Definitions

In the table below are definitions of terminology used in this report

Agroforestry

Is a land management system where trees, crops and livestock are intermixed enabling a sustainable agricultural system.

Biodiversity

Refers to the variety of living species on earth and includes plants, animals, bacteria and fungi. Is crucial for ecosystem resilience, providing the variety of life that supports everything from food production to clean air and water.

Bean to Bar

Is a business model where the chocolate maker controls the entire process from buying the cacao beans to making the end product – chocolate. Also called craft chocolate.

Cacao Vs cocoa

These two names are often interchanged and mean the same. Technically cacao is the botanical name of the plant, 'Theobroma Cacao'. Cocoa is a by-product of the process when cacao/ cocoa cake is ground to a powder e.g. cocoa powder.

Cacao seeds / Cocoa beans

Cacao pods contain cacao seeds, they can be germinated to grow a cacao tree. Technically they are not beans although they are often referred to as beans.

Commodity cacao

Bulk cacao/ cocoa is used by large manufacturers. Often different varieties are mixed, not always fermented or fermented well. Often comes from small farm holders who don't have the infrastructure to ferment and dry, sometimes it is dried on the road leaving a taste of rubber, petroleum or a metallic taste.

Craft chocolate

Is a business model where the chocolate maker controls the entire process from buying the cacao beans to making the end product – chocolate. Also called Bean to Bar.

Ethics

Ethics often informs our responsibilities toward the environment and each other, guiding how we make decisions that impact future generations.

Fine flavour cacao

Cacao that is free of defects while providing a complex flavour and aroma profile that reflects the expertise of the producer and the terroir, a sense of the environment where the cacao is grown, fermented and dried. Fine cacao is approximately 0.14% of global production.

Regenerative agriculture

Regenerative agriculture focuses on reducing the impact of production and prioritises conserving and rehabilitating the land while actively improving the health of the soil.

Seed Vs Bean

Technically it is called a seed when it is able to germinate. During fermentation the seed dies and loses its ability to germinate and then becomes a bean. Often the seeds are referred to as beans and the two words are often used in the same context

Sustainability

Sustainability focuses on meeting present needs without compromising the ability of future generations to meet theirs, emphasising the importance of balancing ecological, social, and economic factors.

Terroir

Terroir is a French term often used in the wine industry to describe environmental factors and refers to the soil, rainfall, aspect and slope. These factors can affect flavour and nuances of the crop.

04

Fellowship Learnings and Findings

The International Experience

The Fellow had the unique opportunity to visit three countries to investigate and compare best practices in cacao farming and chocolate manufacturing. This experience included collaborating with esteemed professionals in the industry and forging relationships that will support and enhance the cacao and chocolate industry in Australia.

Costa Rica

- Centre for Tropical Agricultural Research and Higher Education (CATIE)
- Cacao farms - Dos Lagunas Hacienda Agroforestal, Nortico, Moore Family Farm, Indigenous Reservation
- Chocolate factories – Del Caribre Chocolate, Sibö Chocolate

Objective:

- To gain an in-depth understanding of history, genetics, cloning and disease.
- Investigate best practices in farming, including sustainability, agroforestry, biodiversity, propagation, grafting, harvesting, fermenting and drying
- Processing the beans into chocolate for the local market and export

Centre for Tropical Agricultural Research and Higher Education (CATIE)

CATIE is recognised as one of the leading research and education centres in Latin America and globally. It houses an International Cacao Collection featuring 1,235 cacao varieties, including rare species of Theobroma. Over the decades, CATIE has conducted extensive research in cacao genetics and cloning, resulting in the development of more disease-resistant cacao varieties. These improved varieties are now being cultivated across Latin America, contributing to enhanced sustainability and resilience in cacao farming.



Figure 1. Centre for Tropical Agricultural Research and Higher Education (CATIE)



Figure 2. CATIE International Cacao Collection



Figure 3. Fellow with leading researcher from CATIE, Dr. Wilbert Phillips-Mora

Cacao was first discovered by Europeans in 1497 when Christopher Columbus encountered it during his voyages. However, Fernando Cortez later brought cacao to Spain, effectively introducing it to European society. Archaeological evidence indicates that the Amazon Basin is the centre of origin and genetic diversity for the cacao tree (*Theobroma cacao*). Humans' earliest known use of cacao dates back approximately 5,600 years, near the borders of Brazil, Peru, and Colombia. The initial signs of cacao domestication occurred in southeast Ecuador around 5,300 years ago, from where it was likely transported by humans to Mesoamerica, where further domestication occurred.

The borders of the Amazon region, particularly between Brazil, Peru, and southern Colombia, represent the highest genetic diversity of cacao. Sharing this genetic source, Colombia benefits from its unique biogeographical conditions, which impart distinctive quality characteristics to its cocoa beans. As a result, three priority regions have been identified within Colombia for cacao cultivation: Tumaco, Caquetá, and Putumayo.



Figure 4. CATIE cacao nursery, three month old seedlings ready for grafting or planting

With new technology old classifications (varieties) no longer exist.

New classifications based on DNA and molecular analysis (commercial and wild varieties) has allowed cacao germplasm to be classified into ten major clusters or groups. All varieties originate from South America. Trinatrio was considered a variety for many years but is not included in the list below because it is a hybrid.

- | | |
|--------------|-------------|
| 1. Amelonado | 6. Inquitos |
| 2. Contamana | 7. Marafion |
| 3. Criollo | 8. Nacional |
| 4. Curaray | 9. Nanay |
| 5. Guiana | 10. Purús |

Disease would be the largest contributor to crop losses. Costa Rica's cacao production was decimated in the 1970's due to *Moniliophthora roreri* (frosty pod rot). Through the Fellow's research he found there were three main diseases affecting cacao in Central and South America.

Frosty Pod Rot – Moniliasis or Monilia (*Moniliophthora roreri*)

As the name suggests it gives the pod a frosty look. It is a fungal pathogen which can be controlled with fungicides on young pods. The powdery like spores can become airborne and quickly spread by wind, rain and humans. One square centimetre can produce 44 million spores. It only affects the fruit and the most effective way to deal with it is to bury the fruit in the ground.



Figure 5. Frosty pod rot (*Moniliophthora roreri*) Photo courtesy of ScienceDirect.com

Witches Broom - *Moniliophthora perniciosa*

Witches' Broom is caused by the fungus *Moniliophthora perniciosa* and causes numerous broom-like shoots, hence the term "Witches' Broom". Brooms are living green shoots, but eventually die giving the characteristic dry Witches' Broom attached to the tree.

The dry brooms take two to three months to form after infection. Finally when the temperature and humidity are right dramatic pink (basidiocarps) mushroom like fruiting bodies form and release new spores.

There is no cure or effective treatment for witches' broom so farmers must focus on prevention, pruning and removing dead leaves and sprouting of brooms.

In the 1990s in Bahia Brazil the industry was decimated by Witches' Broom and cost the industry approximately 200,000 jobs. While Witches' Broom originated in the Amazon Basin the disease spread faster than ever before.

This time it has been termed bioterrorism as some people have confessed to introducing it to the region with the intent of destroying the industry.



Figure 6. Witches' broom (*Moniliophthora perniciosa*) Photo Courtesy of Perfect Daily Grind

Black Pod Disease - *Phytophthora palmivora*

Is a fungal disease of cocoa trees and its spores are spread via heavy rainfall. The symptom of black pod disease is a necrotic lesion on the cocoa pod which is brown or black in colour, it eventually enlarges to cover the whole pod, which takes about eight days. The infection is not only on the pods surface but also affects the seeds inside. In the next stage of the infection the growth of white mycelia is visible on the black pod; this is notable after 11 days and sporulation is initiated.

The pathogen can be found anywhere on the tree but is most notable for the black mummified appearance of the fruit. The pathogen can be greatly reduced if leaf litter is allowed to stay on the ground; chemical control is used in more severe cases.



Figure 7. Black Pod Disease

Cacao Swollen Shoot Virus (CSSV)

Is a disease caused by a virus on cacao plantations in West Africa and causes significant crop losses. A resurgence has occurred in Côte d'Ivoire since 2003. It was first discovered in 1946 and has spread to the entire cacao production area to this day.



Figure 8. Swollen shoot virus. Photo courtesy of DiSnouk

Pests can also have a devastating effect on crops; the most common pest in Costa Rica is the squirrel. The picture on the following page shows where a squirrel has eaten through the outer shell of the pod to gain access to the sweet mucilage and seeds inside.

Dos Lagunas has a thoughtful approach to pest management. By cultivating small coconuts to attract squirrels away from cacao, they promote a balance in the ecosystem while minimising harm to the animals. This strategy not only protects their crops but also fosters a sense of harmony with nature. It's a great example of how sustainable practices can lead to a more holistic agricultural system.



Figure 9. The remains of a cacao pod after a squirrel has eaten through the outer case/exocarp to access the seeds.

The Fellow gained further insights into the latest agricultural methods and best practices by visiting the aforementioned farms.

Dos Lagunas Hacienda Agroforestal



Figure 10. Dos Lagunas farm

Founded by Jorge Rossi Chavarria in 1942, Dos Lagunas Hacienda Agroforestal emerged from the union of two farms, spanning over 2,000 hectares. Today, the farm is operated by third-generation family members who continue to uphold the founder's values and commitment to environmental stewardship. Notably, eighty percent of the original land has been returned to Indigenous communities or regenerated into natural forest, leaving 400 hectares currently under cultivation.

Originally established as a cattle farm, Dos Lagunas has transitioned to a regenerative farming system inspired by the rich biodiversity of the surrounding native forests. The farm prioritises organic sustainable practices, with most organic inputs produced on-site. This approach embodies a true agroforestry system, integrating crop cultivation with livestock management to create a diverse and balanced ecosystem. While cattle remain an integral part of the farming operation, the introduction of crops such as cacao and bananas along with trials of vanilla and other fruit trees enhances the farm's agroforestry model, fostering ecological resilience and productivity.

Some advantages of their system are:

- Water and carbon cycles are enhanced
- Chemicals are eliminated
- Recovery and consolidation of soils is favoured
- Biodiversity and yields increase
- Soil fertility is improved due to the integration of grazing and plantation areas. This also favours livestock by providing shade and sources of food
- Their pasture farming activity enriches the production of cacao, through the use of the cattle's excrement as the main component of their own organic fertiliser

All their processes are developed under the circular production model, turning waste into resource that can reintegrate with nature without contaminating it.



Figure 11. Stage 1 - experimenting with making their own microbes for fertilising the crops. Stage 2 - they are now moving from 200 litre barrels to 1,000 litre tanks

Dos Lagunas has their own nursery enabling them to be more self-sustainable. They germinate their own seeds before planting into nursery bags to grow into seedlings. Specific seeds will be chosen for the root stock and usually another one for the grafting. The grafting takes place when the seedling is around three months.



Figure 12. The cacao seeds are first washed to remove the white mucilage pulp. The seeds are then mixed with moist sawdust and placed in a breathable bag in a dark place for three to four days.

When the seed germinates a white tip will appear at one end. Refer Figure 13. The seed is now ready for planting; the white tip goes into the soil/ substrate, the seed is only buried halfway.



Figure 13. The white tip of the root is now visible and ready for planting

Adrian Rossi (Manager) – third generation family member is now managing the farm at Dos Lagunas. In the picture (Figure 14) Adrian is pointing to the young graft at the bottom of the trunk of the seedling. Once the graft has taken and growing well the main trunk/ stalk will be removed leaving only the graft.

The benefits of grafting are it enables the nursery person to choose a strong genetic variety for the root stock and the graft from another variety that produces fine flavour fruit/ chocolate.



Figure 14. Adrian Rossi

Cacao generally has two harvests per year, a major one and a minor one, and six months apart, although some areas may harvest every two to four weeks if they have enough wet seeds/ beans to fill a fermentation box.

Harvesting is still done by hand to this day, unlike other fruit that crops once per year, cacao pollinates continuously throughout the year, therefore pods are ready at different times making mechanical harvesting impossible.

The pods are traditionally opened using a machete, but a much safer way is using a block of wood with

a sharp edge attached (refer Figure 15), this way there is less chance of accidents, the seeds are removed by hand. (refer Figure 16)

Care is taken not to include the placenta which the seeds are attached to. There is a machine that can do this although many people prefer to do it manually to prevent damage to the seeds and to make sure there is none of the placenta still attached. If the seeds are damaged they can go mouldy which can spoil a full batch of fermented seeds.

The wet seeds are then loaded into a fermentation box (refer Figure 17) which usually holds between 100-130 kilograms; in some facilities the fermentation box can hold up to 500 kilograms. The box is filled 50-75 millimetres from the top as the seeds expand during the first two days of fermentation. The seeds are covered with banana leaves because it is believed they have natural yeasts on the leaves which helps the fermentation process.



Figure 15. Harvested cacao pods ready to be opened and seeds removed.

The banana leaves are then covered with two to three layers of jute (hessian bags) to keep it warm. This is the traditional method.

Anaerobic Fermentation



Figure 16. Seeds are removed by hand

The first two days are anaerobic fermentation i.e. without oxygen. The ferment needs to maintain a temperature around 50°C. In the first two days alcohol is produced.

Aerobic Fermentation

Each day for the next 3-5 days the fermenting seeds need to be turned to maintain an even ferment and incorporate oxygen, this is aerobic fermentation, the alcohol turns to acetic acid. The turning is done either by manually using a scoop to transfer the seeds by hand from one box to another or tipping the seeds from one box to another, manually or mechanically.

The fermentation will take 5-7 days depending on the temperature of the ferment and the weather. Some farms will ferment in boxes side by side (refer Figure

17) while others will use the cascading method (refer Figure 18), this method relies on gravity to help move the seeds to the next box which is lower down. The front of the box is removable to make it easier to transfer the seeds into the next box.

The fermentation boxes in Cost Rica are traditionally made from Laurel, this timber is neutral and does not impart flavour on the fermenting seeds. The boxes have holes in the bottom to drain excess juice as the seeds ferment, the juice can be kept and is quite sweet to drink.



Figure 17. Fermentation boxes



Figure 18. Cascading fermentation boxes

The next stage and the final process on the farm is drying the seeds. Once the seeds have completed

fermentation, an experienced farmer can tell by the look and the smell when they are ready. The seeds are then transferred to the drying tables which are located in drying sheds or tunnels (refer Figure 19.), these sheds/ tunnels are covered in opaque plastic which becomes like a hot house and protects the seeds from direct sun and rain, the walls and ends can be raised or lowered to allow for air circulation, so the moisture/ humidity is removed by the wind.

The tables which have a mesh base allow air to circulate and dry the seeds quicker, the seeds must be moved several times in the first day, this is to remove the remaining sticky fermented pulp that is still stuck to the seeds. This is called polishing the seeds. If this is not done the seeds will stick together. The drying process takes several days depending on the weather. In wet weather if the drying takes too long the seeds can become mouldy which imparts a flavour to the seeds which is not desirable and very unpleasant.

The dry seeds need to have a moisture content of 6-8%, more than this and the seeds can go mouldy.



Figure 19. Drying shed and tables

Nortico

Nortico is a family farm and life project founded by an enthusiastic cacao connoisseur Aldo Sánchez from Costa Rica and Ann-Elin Norddal an engaged world traveller from Norway. The name reflects their roots - “NOR” for North of Norway and “TICO,” an idiomatic term for native Costa Ricans.

Established in 2016, Nortico has transformed deforested pastureland into a thriving tropical cacao forest, resembling a secondary forest in just four years. Their efforts focus on reforestation

and promoting biodiversity, essential for combating climate change. By practising agroforestry, they create a sustainable environment where cacao trees flourish alongside diverse plant and tree species, enhancing ecosystems through improved soil health, air purification, water retention, and pollination.

Nortico is not just about cacao; it's a holistic approach to agriculture that emphasises the importance of nature conservation and sustainable living.



Figure 20. Fellow at Nortico Farm

Nortico cacao farm, rooted in agroforestry principles, enjoys numerous direct benefits that enhance both its ecosystem and productivity:

1. **Erosion Prevention:** The farm's hillside location benefits from reduced soil erosion, thanks to the diverse root systems of various plants.
2. **Increased Pollinators:** The variety of plants attracts a greater number of pollinating insects, essential for healthy cacao production.
3. **Soil Health:** The agroforestry system improves both the chemical and physical properties of

the soil, leading to better crop yields. (refer Figure 22.)

4. **Microbial Development:** Decomposing leaf litter fosters a rich community of beneficial microbes, enhancing soil fertility. (refer Figure 21.)
5. **Wildlife Habitat:** The diverse plant life creates a welcoming habitat for birds and other wildlife, promoting biodiversity.
6. **Fruit and Berry Harvest:** In addition to cacao, the farm yields fruits and berries, providing food for the family and opportunities for local market sales.
7. **Scenic Landscape:** The combination of diverse flora contributes to a beautiful and attractive landscape.
8. **Cooler Microclimate:** The agroforestry setup helps maintain a cooler environment, benefiting both plants, animals and people.

Overall, Nortico cacao farm exemplifies how agroforestry can support sustainable agriculture while enhancing ecological health.

Nortico cacao farm exemplifies a commitment to sustainability by integrating cacao with bananas, citrus, and legumes. This diverse planting not only fosters a balanced ecosystem but also supports a sustainable environment for both people and nature. By creating a space for learning and living, Nortico produces high-quality cacao for their premium chocolate while prioritising ecological health. Achieving organic certification, however, is a significant challenge. Nortico's approach to certification involved collaborating with other local farms, allowing them to share resources and streamline the complex paperwork and regular audits required for organic status.



Figure 21. Microbe enriched leaf litter

This collective effort helps reduce costs, as individual farms often struggle to navigate the intricate certification process alone.

Despite the ability to command higher prices for certified organic cacao, the costs associated with certification can outweigh the benefits, especially given the additional requirements imposed by the Costa Rican government. Farmers frequently express frustration with the cumbersome bureaucracy and the lack of supportive incentives, which complicate access to funds and assistance intended for organic producers.

In summary, while Nortico's agroforestry practices and organic certification showcase a model for sustainable farming, the broader challenges faced by Costa Rican farmers highlight the need for systemic improvements to support organic agriculture.



Figure 22. Improved crop yields

Moore Family Farm

The Moore Family farm is run by an extended family, who live a very simple lifestyle and still cook over an open fire in an open kitchen (refer Figure 23).

Located near the Caribbean coast, this 20-hectare farm (finca in Spanish) is managed by José Alberto Moore. The farm is known for its diverse cultivation of cacao, bananas, nutmeg, vanilla and various tropical fruits.



Figure 23. Four room family home

Key Benefits of Intercropping

1. Bananas: Often intercropped with cacao, bananas provide shade and help maintain soil moisture.
2. Nutmeg: Is another significant crop.
3. Vanilla: Grown alongside cacao, vanilla is a valuable crop due to its high market demand.
4. Tropical Fruits: The farm also grows a range of tropical fruits, including papayas, water apples, rambutans and mangoes.

Intercropping is beneficial not only for the environment and ecosystem, it also provides cash flow for the farm between the two harvesting seasons of cacao.

José Alberto continues the legacy of his grandfather by growing local “criollo” cacao alongside modern CATIE clones to enhance productivity.

The Moore family Farm's cacao cultivation is very impressive. They focus on traditional and modern techniques to ensure high-quality cacao production.



Figure 24. The majority of cacao seeds are a deep purple, maroon colour inside



Figure 25. A rare Criollo variety called 'Porcelana' the seed is white



Figure 27. Fellow smelling the fermenting cacao seeds, day 4. A very strong acetic acid smell



Figure 26. Amelonado cacao, the yellow ones are ready to harvest



Figure 28. An excellent example of Trinitario cacao, ready to harvest

Key Aspects of their Cacao Cultivation

- **Diverse Varieties:** They grow local “criollo” cacao, known for its fine flavour, alongside modern CATIE clones, which are more resistant to disease and pests.
- **Sustainable Practices:** The farm employs organic farming methods, avoiding synthetic pesticides and fertilisers. They use natural compost and organic matter to enrich the soil.
- **Agroforestry System:** Cacao trees are intercropped with other plants like bananas, nutmeg and vanilla. This not only maximises land use but also creates a more resilient ecosystem.
- **Shade Management:** Cacao trees thrive under the shade of larger trees. The farm carefully manages the canopy to provide optimal light and shade, which helps in maintaining the health of the cacao plants.
- **Fermenting and Drying:** After harvesting, cacao seeds/beans undergo a fermentation process, which is crucial for developing their flavour. The beans are then sun dried before being processed further.
- **Community Involvement:** The farm engages with the local community, providing employment and supporting local initiatives. They also offer educational tours to share their sustainable farming practices with visitors.

Indigenous Reservation Farm

This indigenous cacao farm near the Caribbean Sea and Panama border is managed by a 79-year-old indigenous lady and her grandson, embodies a deep connection to traditional farming methods. Their approach reflects a profound understanding of the ecosystem, emphasising harmony over intervention.

Key practices at the farm include:

1. **Minimal Intervention:** The absence of pruning allows the cacao trees to grow naturally, fostering a diverse habitat.
2. **Natural Decomposition:** When trees fall, they are left in place to decompose, enriching the soil and supporting microbial life.
3. **Pest Management:** Instead of using insecticides or pesticides, the farmers work with the ecosystem, finding ways to coexist with pests rather than eliminate them.
4. **Ecosystem Belief:** They hold a philosophy that all flora and fauna play a vital role in the ecosystem, promoting biodiversity and ecological balance.

This traditional method not only preserves the integrity of the land but also produces cacao that is rich in flavour and cultural significance. The farm serves as a living testament to sustainable practices rooted in indigenous knowledge, illustrating the importance of respecting natural processes in agriculture.

The Fellow experienced a fascinating glimpse into the traditional way of life. The process of making a drink from roasting the cacao to the aeration with a three-pronged stick, really highlights the deep connection with their ancestors. They also made a rustic unsweetened chocolate which was quite an experience, especially considering the labour that goes into fermenting and drying the cacao. It's interesting how flavours and textures can vary so much from what we're used to in more commercial products.



Figure 29. The 79 year old indigenous lady explaining how this tree is used for medicinal purposes, it is brewed like a tea and given to sick children



Figure 30. Fermented and dried cacao beans with three varieties of cacao pods.

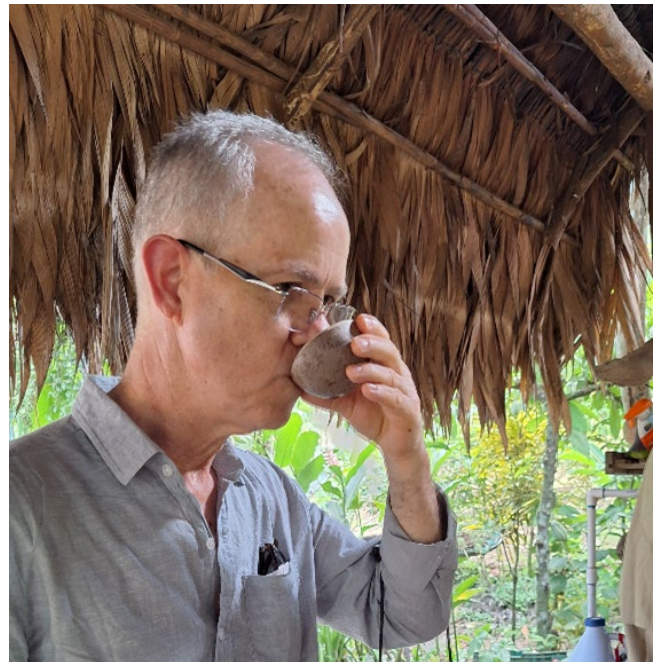


Figure 31. Fellow drinking the traditional drink. It tasted surprisingly good.

Del Caribe Chocolate Factory

The Fellow visited the Del Caribe Chocolate factory in central Costa Rica, this is a second-generation family owned company providing high quality chocolate for over 30 years and exports around the world. They source their cacao beans from five Central American countries where farms are strictly managed and audited. The factory receives the beans and the complete process from fermentation to final product and packaging is completed on site. The company has extensive experience in the entire cacao supply chain, including cultivation and post harvesting practices right through to making fine chocolate couverture.

At Del Caribe they pride themselves in paying a fair price for their cacao and exceed the environmental and labour guidelines of each country that supplies them, as they see this as essential to the sustainability of the farmers and their business.

Del Caribe process approximately 7 tonnes of wet beans per week, they ferment and dry the beans ready to be processed into chocolate. This equates to 250 tonnes of chocolate per year (250,000 Kg). They have their own on-site laboratory for

testing samples of beans and running test batches of chocolate which enables them to maintain a consistent quality.



Figure 32. Two of Caribe's chocolate refiners (Photo courtesy of Ecole Chocolat)

Sibö Chocolate

Sibö chocolate is nestled in the hills surrounding San Jose, the capital of Costa Rica. Founded by George Soriano and Julio Fernandez in 2007, Sibö Chocolate is a small but significant player in the Costa Rican chocolate scene. Sibö's mission to leverage chocolate making for broader social and environmental goals is inspiring. By focusing on economic opportunity and sustainability, it not only enhances the local economy but also fosters a culture of responsible production. Sharing their expertise with emerging chocolatiers and improving post-harvest processes shows a commitment to collaboration and innovation.

Helping found Costa Rica's Association of Chocolate and Cacao (ICACAO) is a significant step towards uniting the industry and promoting best practices. Prioritising quality and sustainability, as these values are essential for positioning Costa Rica as a leading chocolate producer. Their efforts can pave the way for a more ethical and prosperous chocolate

industry, benefiting both the environment and the communities involved



Figure 33. Julio Fernandez, Co-founder of Sibö Chocolate. (Photo courtesy of Siböchocolate.com)

Sibö Chocolate believes sustainability involves business ethics and how they use our natural resources, as well as mitigating our impact on the environment and communities. Sustainability is in everything they do from how and where they source their ingredients, using recycled materials for their packaging, to waste management, composting and converting into organic fertiliser for the vegetable and herb garden.

Sibö Chocolate is now well established in the Costa Rican chocolate scene having won many awards for business innovation, creativity, environmentally responsible as well as numerous awards for their chocolate.



Figure 34. George Soriano, Co-founder of Sibö Chocolate (Photo courtesy of Siböchocolate.com)

Key Learnings from Costa Rica:

- The emphasis on sustainable organic farming, including agroforestry, is commendable, as it benefits both the land and the longevity of agriculture. This holistic approach not only supports environmental health but also ensures the long-term viability of cacao production
- Maintaining ethical practices within the supply chain is crucial for the ongoing success and prosperity of all stakeholders involved. It's impressive how these farms prioritise biodiversity and ecosystem health while still producing high-quality cacao
- The Fellow's experience has been incredibly enriching and will play a vital role in developing a Bean to Bar chocolate course and micro-credential. Cacao production can be seen as an 18th-century agricultural system that provides a product for a 21st-century industry

Hawaii

The Fellow's journey to Hawaii has truly exceeded expectations, providing deep insights into both traditional and modern sustainable cacao farming practices. This experience is set to significantly enhance the Bean to Bar program in Australia, as the knowledge gained will be invaluable for fostering innovation and collaboration within the industry.

While cacao farming in Hawaii dates back to the 1850s, it wasn't until the late 1990s, following the decline of sugar crops, that it began to gain traction. Today, a new generation of farmers—many of whom are botanists and agronomists trained at the University of Hawaii—are leading this resurgence. The connections and relationships established during the Fellow's experience will not only enrich his expertise but also contribute to a vibrant and sustainable chocolate movement in Australia. It's exciting to envision how these insights will influence the future of cacao production and chocolate-making down under!

Oahu:

The Fellow spent seven days on Oahu where he visited the following:

- Kamananui Estate, Mapele Fields, 21 Degrees Estate, Kualoa Ranch
- Manoa Chocolate factory
- Hawaii Chocolate and Cacao Association Conference

Objective:

- To initiate and foster relationships for ongoing collaboration
- To gain an in-depth hands-on understanding of operating a cacao farm/ orchard
- Investigate best practices in farming using traditional and modern techniques, including planting, grafting, harvesting, fermenting and drying
- To gain a complete understanding of Bean to Bar craft chocolate

Kamananui Estate

Kamananui Estate, situated in the scenic foothills of Mount Ka'ala on Oahu's North Shore, has transformed over the past six years into a thriving cacao farm. Originally requiring extensive clearing and preparation, the estate now features an innovative agroforestry model. This approach integrates cacao with windbreaks, fruit trees, and tall hardwoods like mahogany, fostering a diverse ecosystem that protects the crops.

To support irrigation needs, a well was drilled, addressing the challenge of insufficient natural rainfall. Today, Kamananui Estate is celebrated for its remarkable genetic diversity in cacao, making it one of the most varied orchards globally. As a testament to its success, the estate's first chocolate bars are now available through Manoa Chocolate, showcasing the unique flavours of this exceptional farm.



Figure 35. Kamananui Estate with Mount Ka'ala (Oahu's tallest peak) in the background (Photo Courtesy of Heirloom Cacao Preservation)

Propagating

At Kamananui Estate they will propagate their own seeds from selected varieties, this careful process ensures that each plant exhibits the best traits from both the root stock and the grafted variety, optimising growth potential, yield and resilience to disease and pests. Once the plants are established, they will monitor their development closely to ensure healthy growth. This method not only enhances the quality of the fruit but also contributes to the sustainability of their agricultural practices.

Grafting

Grafting can be performed at the seedling stage or to an older tree. When done to an older tree the bark is cut and partially peeled back, then a young shoot is cut like a wedge (refer Figure 36), allowing the shoot to be inserted behind the bark then a non-adhesive tape is used to hold the shoot in place. Once the graft is secured and protected from direct sun it's important to monitor it closely. The young shoot should begin to integrate with the older tree, forming a callus around the graft site.

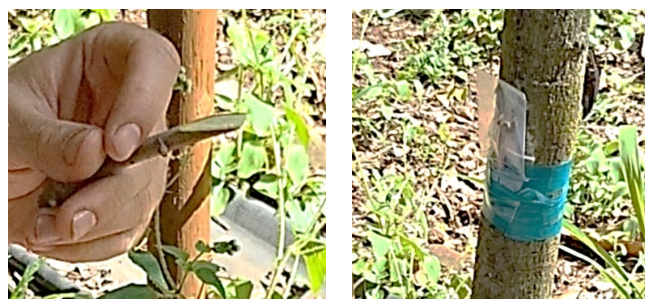


Figure 36. (left)

Figure 37. (right)

After a few weeks, you can check for signs of growth, such as new leaves emerging from the grafted shoot. Once the graft has successfully taken and the shoot is showing healthy growth, the tape and protective bags (refer Figure 37) can be gradually removed. It's essential to continue caring for the grafted area, ensuring the tree receives adequate water and nutrients. Over time, the graft will develop into a strong, productive branch, benefiting from the robust root system of the older tree while offering the desired characteristics of the new variety. This technique allows for the rejuvenation of older trees and the introduction of superior varieties, enhancing overall yield and fruit quality.

Planting

After the seedlings are planted (refer Figure 38), they need consistent care to ensure healthy establishment. Regular watering is crucial, especially in the initial weeks, to help the roots settle into their new environment. The shade cloth covering the wire cage will help mitigate harsh sunlight and reduce stress on the young plants, allowing them to acclimate gradually.

As the seedlings grow, monitoring for pests and diseases is essential. The stakes will help support the cylindrical cage providing protection from animals and potential wind damage. Over time, as the seedlings establish strong root systems and begin to thrive, the cages and stakes can be removed.

The planting process not only contributes to the estate's future yield but also provides valuable hands-on experience for those involved. With seedlings marked with the Fellow's name (refer Figure 39), it fosters a sense of ownership and connection to the plants. This approach reflects a commitment to sustainable practices and the careful cultivation of a diverse and productive landscape at Kamananui Estate.



Figure 39.



Figure 38. Fellow planting a seedling

Terroir

The question of whether terroir influences flavour is indeed a fascinating and complex topic. While some argue that genetic factors play a more significant role in determining taste, many enthusiasts and experts believe that the specific conditions in which a plant grows—such as soil composition, sunlight exposure, rainfall, and microclimate—can significantly shape its characteristics.

The ongoing trial in Hawaii is particularly interesting, as it aims to isolate these variables by planting the same genetic variety in diverse locations. By analysing how different environmental factors affect flavour profiles over the next few years, researchers hope to shed light on this debate.

If the results support the idea that terroir does affect flavour, it could have profound implications for agricultural practices and product marketing, similar to the way terroir is celebrated in the wine industry. Ultimately, understanding the nuances imparted by different growing conditions could lead to more refined cultivation techniques and a deeper appreciation for the complexities of flavour in various crops, not only cacao.

Harvesting

Manual harvesting allows for careful selection, ensuring that only the ripest pods are picked, which is crucial for producing high-quality chocolate (refer Figure 40). Each pod is harvested at its peak, which contributes to the nuanced flavours desired in fine chocolate. After picking, the seeds are extracted by hand, a labour-intensive process that ensures minimal damage to the seeds (refer Figure 41).

The absence of mechanical harvesting is particularly important for fine flavour cacao, as the varied ripening times of the pods require a more delicate approach. This method not only helps maintain the integrity of the beans but also allows for better control over fermentation, a key step in developing the final flavour profile of the chocolate.

By following these meticulous practices, producers can enhance the quality and complexity of their chocolate, aligning with the growing consumer

demand for artisanal and sustainably sourced products. This dedication to craftsmanship in harvesting and processing reflects a broader commitment to excellence in the chocolate-making process.



Figure 40. Harvesting the pods

Fermentation

The next crucial step is fermentation. Wet seeds, encased in a white mucilage, are placed in a fermentation box (approximately 750 mm cube), with a 5-10 cm gap at the top to allow for expansion during the first two days. Traditionally, the seeds are covered with banana leaves and layered with jute bags to maintain warmth, ideally around 50°C. This environment encourages the natural yeasts from the banana leaves and the surrounding air to initiate the fermentation process.

Fermentation typically lasts 5-7 days, influenced by weather conditions. The initial two days involve anaerobic fermentation, which occurs without oxygen and produces alcohol. After this phase, the seeds are moved to another box for aerobic fermentation, where oxygen transforms the alcohol into acetic acid.

To ensure uniform temperature and consistent fermentation, the seeds are turned and transferred to a new box each day. This process allows for the development of precursors that enhance flavour. Once fermentation is complete, the seeds are considered dead and can no longer germinate, transitioning to being referred to as beans—a term commonly used in the industry.



Figure 41. Extracting the seeds from the pods



Figure 42. Fermentation box

Drying

Drying is the next critical step in the process, as it is essential for preventing undesirable acidity in the final chocolate. Proper drying ensures the beans reach a moisture content of 6-8%. If moisture levels exceed this, the beans risk developing mould, which can negatively affect the flavour.

An important aspect of drying is “polishing.” This involves moving the beans around on drying tables, rubbing them against the underlying mesh. This mesh not only promotes air circulation but also helps remove any remaining sticky brown mucilage from fermentation. If the beans are not polished, they can clump together during drying, leading to broken beans and potential contamination when separated.



Figure 43. Drying tables

Additionally, beans are often dried in tunnel-like structures made of steel frames covered with heavy-duty plastic. This setup protects the beans from rain and helps retain heat, accelerating the drying process. The ends and sides of these tunnels can be opened to facilitate air circulation, especially in humid conditions.



Figure 44. The small bags of beans are trial batches from specific cacao varieties. It is difficult to ferment in small batches and maintain an even consistent temperature so they are fermented within a larger batch. The beans will be made into chocolate, then a decision will be made whether to continue the trial to the next stage.

Disease and Pests

Hawaii is fortunate in its cacao cultivation due to its unique location, which minimises exposure to many diseases found elsewhere. While Black Pod disease is present, it lacks more severe threats like Witches Broom and Monilia. However, this situation could change if biosecurity measures are not strictly enforced. Although Cacao Badnaviruses exist, they are not widespread and have minimal impact on cacao production compared to other crops.

Pests can still pose challenges, varying by location. Common pests include the Japanese rose beetle, Queensland Longhorn Beetle (which was accidentally introduced on the Big Island), rats, and wild pigs. The larvae of the Longhorn beetle tunnel through wood, weakening plants and disrupting their nutrient and water transport.

At Kamananui Estate, the primary pest identified was wild pigs, which can severely damage cacao trees while trying to access the pods. The implementation of a low-level electric fence effectively mitigated this issue, while rats were found to be less problematic.

Mapele Fields

Mapele Fields is a cacao farm, fermentary, and nursery owned and operated by Ben Fields, who is known as the “King of Fermentation” in Hawaii. With years of experience, Ben has honed his craft to produce consistently high-quality cacao. He not only ferments his own beans but also provides fermentation services for other farms. This arrangement allows some farmers to focus solely on growing cacao while outsourcing the fermentation and chocolate-making processes. Ben’s expertise plays a crucial role in enhancing the quality and flavour of the final product.

Kualoa Ranch and 21 Degrees Estate

During his time in Hawaii, the Fellow visited two distinct cacao farms: 21 Degrees Estate and Kualoa Ranch, which represent opposite ends of the scale in terms of size and production.

21 Degrees Estate is a 10-acre, family-owned cacao farm in its sixth year of production, known for producing excellent chocolate. While they grow their own cacao, they outsource the chocolate-making process, allowing them to focus on cultivation.

In contrast, Kualoa Ranch spans 4,000 acres and operates as a working cattle ranch. In addition to cacao, it produces a variety of crops and tropical flowers, as well as raising beef, pork, lamb, shrimp, and oysters. Kualoa Ranch is also expanding its cacao production and is a popular filming location for movies like Jurassic World. The ranch is committed to strong ethical practices and conservation efforts, ensuring that everything is responsibly grown and that 100% of their harvest is consumed locally, supporting healthy food systems and reducing food miles.

Manoa Chocolate

During the Fellow’s visit to Hawaii, he spent time at Mānoa Chocolate, a significant player in the Hawaiian chocolate industry known for producing award-winning chocolate with unique flavour profiles. The name Mānoa means “solid,” “vast,” and “depth” in Hawaiian, reflecting their commitment to caring for the land from which they harvest their cacao, the nuanced process of chocolate crafting, and their aim to leave the world better than they found it.

Mānoa Chocolate operates on the windward side of O’ahu in Kailua, featuring two locations: a wine bar and chocolate tasting area, which also houses packaging for their products, and a factory located in an industrial estate on the outskirts of Kailua.

The Fellow spent two days learning the complete Bean-to-Bar chocolate-making process, including steps like bean selection, roasting, cracking and winnowing, pre-grinding, and refining using ball mills. Once refined, the chocolate is transferred to the packaging location for tempering, moulding, and packaging, ready for sale or distribution. In addition to traditional chocolate bars (plain and flavoured), they create panned items like hazelnuts and macadamias, chocolate and nut spreads using stone melangers, cacao tea, and cacao wine, which has received positive feedback and is very refreshing.

Mānoa Chocolate has evolved from a small operation, scaling up as needed to enhance efficiency. Their factory is now state-of-the-art, with every process controlled via iPads—monitoring factors like roasting temperature and time, as well as chocolate pumping to the ball mills. Each stage is equipped with sensors to halt production if any parameters are not met. They began with small bench-top wet stone grinders that produced around 4 kg per batch, then transitioned to larger Cocotown stone grinders/melangers producing 25 kg batches, which take three days (72 hours). Now, they utilise ball refiners/mills with a capacity of 120-125kg that can achieve the same quality in just three to four hours.

The factory consists of the following equipment:

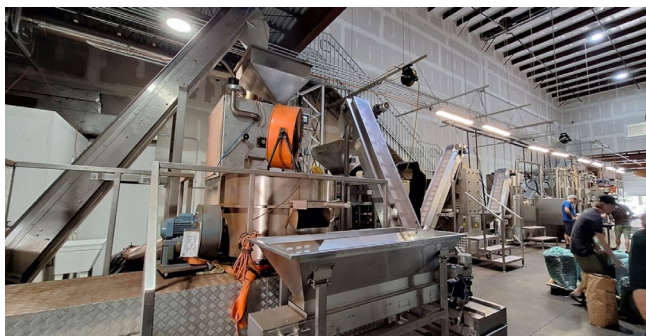


Figure 45. Roaster - Manoa Chocolate Factory

The Manoa Chocolate Factory has an impressive roasting capacity of up to 800 kg per day, typically operating two to three times a week. The process begins with loading the cacao beans into a trough, which then conveys them to a hopper at the top of the roaster. All the beans are roasted simultaneously, with the roasting time and temperature adjusted to achieve the desired flavour profile. While Manoa utilises a hazelnut roaster, many other operations may opt for converted coffee roasters, depending on their specific needs and production volume. This flexibility allows chocolate makers to customise their roasting methods for optimal flavour development.



Figure 46. Each piece of equipment in the production line is controlled on an iPad (stop, start, temperature, time volume etc)



Figure 47.



Figure 48.



Figure 49.

After roasting, the beans are cooled and then processed in the 'Cracking and Winnowing' machine. This machine uses rollers to crack the beans into smaller pieces while a fan blows away the husks.

Next, the cracked beans are fed into a pre-refiner, which grinds them into a coarse, flaky paste (refer Figure 48 and 49). This paste is then transferred to a ball mill, where the particle size is further reduced to create cocoa liquor or cocoa mass (refer Figure 50). Depending on the type of chocolate being produced, it may be pumped to an additional ball mill.

At this stage, sugar and milk powder are added for milk chocolate, while various flavours, such as freeze-dried passionfruit, pineapple, or guava, can also be incorporated to enhance the chocolate's profile. This meticulous process allows for a wide range of chocolate varieties and flavours to be crafted.



Figure 50. First ball mill where the pre-ground beans are refined into cocoa liquor / cocoa mass



Figure 51. Production line - from left to right: two ball refineries, two conches, strainer above the holding tank.

Once the chocolate reaches the desired particle size of approximately 18 microns (μm), the tool used for this is called a Grindometer. The chocolate is transferred to a conche, this machine stirs and aerates the chocolate, and helps to develop its flavour while allowing volatile acids to escape. The conching process can last anywhere from several hours to overnight, depending on the desired outcome.

After conching, the chocolate is passed through a very fine sieve (refer Figure 52) into a heated holding tank below, this removes any foreign particles. This step ensures a smooth and consistent texture in the final product. It is now ready for the next step of tempering, moulding, packaging, distribution and/or retail.



Figure 52. This sieve is 1 metre in diameter, has three arms with brushes that slowly rotate allowing the chocolate to pass through and catch any foreign objects. It also vibrates assisting the chocolate to pass through.

Chocolate and Cacao Association Conference.

While in Hawaii, the Fellow attended the annual Hawaiian Chocolate and Cacao Association Conference, which focused on both local farming practices and strategies for marketing premium chocolate produced in a first-world context. Hawaiian chocolate makers face challenges in competing with large manufacturers that source commodity cacao from third-world countries, where many farmers live in poverty. Hawaiian Bean to Bar chocolate emphasises ethics in the supply chain and sustainability.

A major topic of discussion was the aspiration to position Hawaii as the “Napa Valley of Chocolate.” Participants explored ideas for promoting Hawaiian chocolate as a premium product through agri-tourism, farm and factory tours, chocolate tastings and sharing stories behind its origin and history.

Education was a key focus, highlighting the differences between Bean to Bar and commodity chocolate. The conference aimed to inform consumers about the reasons for the higher cost of Bean to Bar chocolate, including differences in taste, ingredients, and production processes. This chocolate is celebrated for its quality, fine flavour, and the meticulous craftsmanship involved in its creation.



Figure 53. Photo Courtesy Hawaiian Chocolate & Cacao Association

Another significant topic was the potential introduction of an appellation of origin on labels, which would require federal approval. This could further enhance the recognition of Hawaiian chocolate as a unique and high-quality product, similar to how wine regions are marketed.

Key learnings from Hawaii

- Building ongoing collaborations and networking within the industry is essential for sharing skills and knowledge among cacao farmers and chocolate makers
- In-depth knowledge of cacao farming in Hawaii, from planting and harvesting to fermenting and drying, including sustainable practices, agroforestry and environmental sustainability will be invaluable to the Australian industry
- Mānoa Chocolate is a key player in the Hawaiian chocolate industry, providing invaluable insights into craft chocolate making from bean selection to packaging
- The conference highlighted the challenges Hawaiian chocolate makers face when competing with large manufacturers that source commodity cacao from third-world countries. It emphasised the importance of ethics and sustainability in the Hawaiian Bean to Bar chocolate movement. Discussions focused on positioning Hawaii as the “Napa Valley of Chocolate,” promoting Hawaiian chocolate as a premium product through agri-tourism, farm and factory tours, and chocolate tastings, while sharing the rich stories behind its origins
- The conference underscored the need to educate consumers about the differences between Bean to Bar and commodity chocolates, detailing the reasons for the higher costs associated with Bean to Bar due to superior taste, ingredients, and craftsmanship

Italy

During the third international visit, the Fellow travelled to Italy to explore SELMI, a prestigious chocolate equipment manufacturer. In their training kitchen, the Fellow engaged in hands-on learning about the Bean to Bar process, gaining insight into the seven key pieces of equipment involved. This immersive experience covered every stage of crafting chocolate from scratch, including roasting, winnowing, pre-grinding, ball refiner, straining, conching, tempering, and moulding. Each step highlighted the intricate details and techniques essential for producing high-quality craft chocolate.



Figure 54. SELMI



Figure 55. SELMI Head office and factory, Pollenzo Bra Italy

Equipment use in the Bean to Bar process.

Roaster

Before roasting, it's crucial to sort the cocoa beans, removing any that are stuck together, flat, or of irregular sizes, as these can lead to uneven roasting. Over-roasting can impart a burnt flavour to the chocolate.

The roaster (see Figure 56) can be preset for various roast profiles. First, it is preheated, then the sorted beans are loaded into the hopper and released into the roasting chamber. A blower circulates hot air, ensuring an even roast throughout the batch. An extraction cylinder allows for testing of the product from the roasting chamber during processing. Once the desired roasting time is reached, the machine automatically discharges the beans into a perforated cooling tray, where they are cooled quickly by a rotating arm and air circulation through the exhaust system.

After cooling, the beans are discharged into a collection container for further processing. Additionally, the roaster features a suction system that allows beans to be drawn directly from storage bags or containers, weighing them simultaneously to streamline the process.



Figure 56.

Winnower

The next step in the chocolate-making process is cracking and winnowing the beans to remove the husk (refer Figure 57). The roasted beans are loaded into the hopper at the top of the machine. As they pass through rollers, the beans are crushed into nibs.

Following this, the nibs move into a separate chamber where there is a constant airflow to separate the lighter husk from the heavier nibs. The husk is carried away by the airflow, while the heavier nibs drop down to a collection point and are gathered into a container for further processing. This efficient method ensures that only the valuable nibs move on to the next stage of chocolate production.

The rollers and airflow can be adjusted for different products and desired quality of separation.



Figure 57.

Grinder

The nibs are passed through the grinder to shorten the production time; this reduces the nibs to a paste depending on the required micron size and product being made, the coarseness of the paste can be adjusted. (refer Figure 58) This machine can also be used for grinding nuts like almonds, pistachios and hazelnuts which are then processed in to nut putters and nut pralines.



Figure 58.

Ball refiner

The paste is then added to the ball refiner (see Figure 59) to achieve the desired micron size, typically between 15 and 20 microns. The ball refiner is a tank filled about halfway with thousands of ball bearings. As the paste is stirred, it is broken down into smaller particles, gradually working its way to the bottom of the tank. From there, it is pumped back to the top to repeat the process.

During refining, additional ingredients such as sugar (and milk powder for milk chocolate) are added in stages, usually two to three additions. Some recipes may also incorporate extra cocoa butter, vanilla, and lecithin, depending on the desired flavour profile. However, many Bean to Bar makers prefer to keep it simple, using just two or three ingredients—cocoa beans, cocoa butter, and sugar—for dark chocolate, allowing the inherent flavours and nuances of the cocoa to shine through in the final product.



Figure 59.

Sieve

After the chocolate has been processed to achieve the desired micron size, it is passed through a very fine sieve (refer Figure 60). This step is crucial for removing any unwanted particles, particularly the remnants of the germ, or radical, which may not fully break down during grinding. Sifting helps ensure a smoother texture and a higher-quality final product by eliminating these larger, undesirable particles.



Figure 60.

Conche

The conching process is indeed a critical step in the bean-to-bar journey. It significantly enhances the chocolate's aromatic profiles by aerating the mixture, which helps to reduce humidity and eliminate any unwanted acidity. During conching, the chocolate is continuously stirred, allowing for a uniform texture and flavour development. This process typically lasts between 8 to 12 hours, ensuring that the chocolate achieves the desired smoothness and complexity before it is moulded and cooled (refer Figure 61).



Figure 61.

Tempering

Once the chocolate is completed, tempering is essential before it can be moulded into bars. This process involves carefully heating the chocolate, cooling it, and then warming it slightly to achieve specific temperatures. This technique helps align the fat crystals in the chocolate, allowing it to set properly. When done correctly, tempered chocolate will have a glossy finish, a satisfying snap when broken, and a smooth texture that melts beautifully in the mouth.

Below are the specific temperature ranges for tempering.

Chocolate	Heat	Cool	Re-warm
White	40-45°C	25-26°C	29-30°C
Milk	40-45°C	25-26°C	29-30°C
Dark	45-50°C	27°C	31-32°C

The continuous tempering machine (refer Figure 62) plays a vital role



Figure 62. Continuous tempering machine Photo courtesy of Selmi

in this process. It features a holding tank of melted chocolate set at the higher temperature and is continuously stirred.

The machine draws chocolate from the tank, cools it to the pre-set temperature, and then re-warms it to the optimal working temperature. The chocolate is released from an outlet just under the control panel; the excess flowing back into the tank. This ensures the chocolate is consistently tempered and ready for use in moulding or other applications.



Figure 63. Chocolate bars after tempering and moulding



Figure 64.

Grindometer

A Grindometer (also known as a fineness gauge) is used to measure the particle size of chocolate (refer Figure 65); the measurement scale is in microns (μm) this instrument is also used in other industries and used for products like paint.

Each chocolate maker has a different view as to what the ideal micron size should be and the type and style of chocolate they are making, whether they want a very smooth chocolate or something more textured. There is no right or wrong, it depends on the style of chocolate and the flavours and nuances they want to bring to the fore. This is personal taste and preference.



Figure 65. Grindometer – BAOSHISHAN. Photo Courtesy of Baoshishan

The international experience

The Fellow's journey took him to three distinct destinations, each showcasing a diverse range of topics related to Bean to Bar craft chocolate. He was genuinely touched by the overwhelming interest and support for his Fellowship, receiving heartfelt comments like, "How can I be a part of it" and "If there's anything I can do to help, please be in touch."

Each country he visited offered exceptional hospitality, with individuals going above and beyond to assist him. The Fellow felt he had forged meaningful professional connections and friendships that will endure well beyond the conclusion of his Fellowship, enriching his experience and contributing to his passion for craft chocolate.

Findings, the Victorian VET sector and industry

The Fellow believes that this comprehensive experience will enable him to make significant contributions to the chocolate industry in Australia. He is committed to promoting sustainable practices and high-quality cacao and Bean to Bar craft chocolate production through education, training, and qualifications. With the insights and connections gained during his Fellowship, he aims to inspire others and foster a deeper appreciation for craft chocolate, ensuring that ethical and sustainable methods are prioritised in the industry.

Strengths, weaknesses, opportunities, and threats

Strengths:

- The strengths of the Fellow's findings present a valuable opportunity to up-skill VET educators, ultimately creating business and employment opportunities while educating the public about ethically sourced, sustainably grown Bean to Bar craft chocolate. By focusing on education, training, and qualifications for this emerging industry, the sector can grow and thrive
- Victoria, recognised as the education capital of Australia, stands to gain significantly from implementing the Fellow's findings. This initiative can position the Victorian VET sector as a leader in training for Bean to Bar craft chocolate, attracting individuals seeking specialised knowledge in this field

Weaknesses:

- One main weakness the Fellow anticipates is the price point of Bean to Bar craft chocolate, which will likely be higher than mass-produced chocolate and confectionery found in supermarkets. However, he believes this challenge can be addressed through education and tasting experiences. Emphasising the values of ethically sourced cacao, sustainable practices, and the rich narratives behind the product will also resonate with consumers helping them appreciate and justify the price

Opportunities:

- This emerging industry can attract interest and investment, driving growth and innovation
- While Victoria may lack the climate for cacao cultivation, the region is well-placed for processing and educating consumers. Factory tours and tasting sessions can transform potential weaknesses into engaging experiences that foster a deeper connection between consumers and the product, interactive workshops where participants not only taste but also learn about the journey from bean to bar, including the farmers' stories and sustainable practices
- Additionally, the craft chocolate movement can foster a community atmosphere, with local festivals and events celebrating the craftsmanship involved. Engaging consumers through social media, pop-up events, or partnerships with local cafes can build a loyal customer base and create a buzz around the movement. This collective effort can not only mitigate competition but also elevate the entire industry, showcasing the rich tapestry of talent and creativity within Victoria's craft chocolate scene

Threats:

- Other states may develop their own education, training, and qualifications in Bean to Bar chocolate making, potentially outpacing Victoria
- Larger producers with greater capital could enter the market, posing competition to small-scale producers. However, the Fellow views this as an opportunity for small producers to create unique artisanal products that reflect their individual stories and values, fostering a diverse market

Benefits of findings: role/ organisation/ sector

The benefits of the Fellow's findings will extend widely. In his role as a VET educator at WAI, he is set to develop a professional development program aimed at up-skilling educators not only at WAI but across the broader VET sector. His manager has tasked him with planning a short course program, which he envisions as a three-tiered approach: introduction, intermediate, and advanced. This structure will allow participants to progressively enhance their skills and knowledge in Bean to Bar craft chocolate.

WAI is well-positioned for this initiative, boasting state-of-the-art facilities with potential for future growth. The Fellow believes that his findings will equip the VET sector with essential skills and knowledge, supporting the development of an emerging and growing industry. This initiative aims to foster a deeper understanding of sustainable practices, cacao production and high-quality Bean to Bar craft chocolate, ultimately benefiting both educators and students in the field.

05

Considerations and Next Steps

The Bean to Bar craft chocolate industry is still in its early stages in Australia and presents opportunities in an exciting emerging sector. Given the lack of education and training options, the Fellow's initiative to develop programs that bridge this gap is both timely and impactful. By establishing local education and training pathways, we can support the industry's growth and help craft chocolate makers and enthusiasts gain the expertise they need without having to rely on overseas training or limited online resources. A more structured breakdown with additional suggestions for short, medium and longer-term strategic goals are presented.

Key Themes:

1. **Industry Growth & Education Gap:** There's a growing interest in Bean to Bar craft chocolate, but a significant gap in education and training is very apparent.
2. **Skills Development for Educators & Students:** A clear pathway for VET educators and students to develop the necessary skills in the craft chocolate space will enable it to grow and thrive.
3. **Collaborative Approach:** Collaboration with industry and government will be crucial for establishing and scaling educational offerings in this field.

Short-Term Actions (6 months)

1. Professional Development for VET Educators

- **Goal:** Equip educators with skills, knowledge and confidence to teach and convey subject matter in chocolate making
- **Action:** Develop and launch a tailored professional development program for VET educators that:
 - Introduces the Bean to Bar process, from sourcing cocoa beans to final product
 - Provides practical skills for educators, keeping up with evolving industry standards
 - Includes guest speakers from the craft chocolate industry, exposure to local chocolate makers, and access to online resources
- **Considerations:**
 - Work with industry experts to ensure the curriculum is up to date with industry trends
 - Use platforms like the OctoberVET, and William Angliss Institute forums to promote and disseminate the program

2. Industry Networking and Partnerships

- **Goal:** Foster connections between local chocolate makers, industry stakeholders, and educators
- **Action:** Develop partnerships with local Bean to Bar chocolate makers to host masterclasses, internships, and workshops for both educators and students
- **Considerations:** This collaboration will help ensure that education remains aligned with current industry practices and needs

Medium-Term Actions (6-12 months)

1. Short Course Program Development

- **Goal:** Develop a tiered short course program with beginner, intermediate, and advanced levels.
- **Action:** Create a modular training program, ideally online and in-person, that:
 - Starts with an introduction to the Bean to Bar process, tasting and appreciation
 - Moves to more complex areas such as fermentation, roasting, tempering, and moulding, including hands-on experience with chocolate production
 - The advanced level would include visiting a farm with hands-on experience, including harvesting, fermenting and drying with a final certification on completion of each level
- **Considerations:**
 - The course should be accessible to both aspiring craft chocolate makers and existing pastry chefs looking to expand their skills
 - Incorporate flexible learning options to cater to working professionals, such as evening or weekend classes

2. Micro-Credential Development

- **Goal:** Provide concise, specialised qualifications for those looking for targeted learning outcomes.
- **Action:** Develop a micro-credential in Bean to Bar craft chocolate making, aimed at individuals who:
 - Are already working in the food industry but want to specialise in craft chocolate
 - Want to quickly gain essential skills without committing to a full qualification
- **Considerations:**
 - Partner with industry to ensure the credential meets employer needs
 - Leverage micro-credentials as a flexible pathway for learners, including those in remote or underserved areas

Long-Term Actions (1-3 years)

1. Integration into Formal Education

- **Goal:** Position Bean to Bar craft chocolate as a formal qualification within the VET system.
- **Action:**
 - Lobby for the inclusion of Bean to Bar craft chocolate as an elective unit within Certificate IV in Patisserie
 - Work with industry and government to incorporate Bean to Bar processes into the existing SITHPAT018 Produce chocolate confectionery unit
 - Explore the possibility of a standalone qualification focused on Bean to Bar craft chocolate
- **Considerations:**
 - This will require evidence of industry demand, potentially through surveys and consultations with chocolate makers and hospitality businesses
 - Engage with professional associations (e.g., Chocolate Manufacturers Association) to help support this initiative

2. Job Skills & Industry Recognition

- **Goal:** Elevate the craft chocolate industry within Australia's culinary ecosystem.
- **Action:**
 - Work with Jobs and Skills Councils (JSCs) to help formalise and recognise skills related to Bean to Bar craft chocolate making
 - Advocate for targeted funding or incentives to encourage more businesses and educational institutions to adopt Bean to Bar craft chocolate into their curricula
- **Considerations:** Government support may include grants for new course development, subsidies for students, or policy changes that promote Bean to Bar chocolate as a viable career path

Other Considerations and Opportunities

1. Government & Industry Support

- Explore the potential for government-backed incentives for new entrants in the Bean to Bar industry—both to promote business growth and the establishment of educational programs
- Consider grants to fund scholarships for students entering the Bean to Bar craft chocolate space, as well as to incentivise small chocolate producers to offer internships or mentorships

2. International Collaboration & Community Support

- Develop programs or collaborations that allow Australian chocolate makers to connect with farmers in cocoa-growing regions like the Pacific Islands
- Encourage fair and direct trade practices as well as sustainable sourcing of cocoa beans, which could be a key focus of the courses, enhancing their appeal to socially conscious learners

Future Research Opportunities

1. Health Benefits of Craft Chocolate

- Conduct research on the health benefits of Bean to Bar craft chocolate, particularly around antioxidant content, reduced sugar levels, and potential impacts on heart health
- Integrate this research into the curriculum, so students are informed about the unique selling points of Bean to Bar products in the health-conscious market

2. Supporting Developing Regions (Pacific Islands)

- Explore ways that Australian chocolate makers and the local industry can collaborate with cocoa farmers in the Pacific Islands to improve sustainable farming practices and empower local communities
- This can be incorporated into both the training curriculum and potentially create opportunities for ethical sourcing practices within the Australian chocolate industry

3. Fair Trade, Direct Trade, Ethics and Transparency in the Supply Chain

- While these topics have been touched on in this report a more in-depth study would be beneficial not only for the Bean to Bar craft chocolate but other craft industries
- Disseminated findings could be very relevant across other artisan crafts and qualifications

By strategically progressing through these phases—starting with educator development, then moving to a structured training program, and ultimately integrating formal qualifications and job skills recognition will help lay a foundation for a thriving Bean to Bar craft chocolate industry in Australia.

Continued Discussion

Scholarship/ Internship SELMI Italy

- **Goal:** To strongly pursue the scholarship program
- **Action:**
 - Actively continue and encourage discussion with Selmi Italy regarding a scholarship program for students
 - Encourage William Angliss Institute to participate in this collaboration with the outlook being very positive, strong and ongoing
- **Outcome**
 - The benefits will be far reaching for WAI, Selmi, students and the VET sector with huge potential for future development

06

Impacts of Fellowship

Personally

The Fellow's reflection of his experience with the cacao community has been deeply moving and shows a level of empathy and awareness that is essential for meaningful engagement with the global cacao industry. It's clear that his journey has not only deepened his understanding of the craft but has also highlighted the profound disparities and struggles faced by cacao farmers around the world. This kind of firsthand experience is invaluable, as it gives context to the complexities of the cacao supply chain, which is often invisible to consumers in wealthier nations.

The cacao community's passion and resilience are often overlooked, but his reflection brings attention to the realities they face. It's a reminder that our daily comforts can sometimes obscure the struggles of those who provide us with the things we take for granted, like chocolate. His experience also underscores how interconnected we all are, even across vastly different socioeconomic environments. Consumers can also help create positive change, by supporting fair trade initiatives and ethical sourcing practices.

Professionally

The Fellowship has been a truly transformative experience, offering the opportunity to connect deeply with both the technical and human aspects of the cacao and chocolate industries. The hands-on engagement with international practitioners and experts in the fields of cacao farming, craft chocolate production and chocolate making equipment as well as the creation of new educational pathways through the scholarship and internship program, are fantastic ways to further enrich the field and create lasting connections across continents. The Fellow's work in bridging William Angliss Institute in Australia and SELMI in Italy is a noteworthy example of fostering global collaboration that will benefit students and professionals alike.

The ability to bring these insights back to his students is incredibly valuable. His firsthand knowledge and new connections will not only deepen their understanding of chocolate-making but also offer them a broader perspective on the complexities of sustainability and community involvement in the cacao industry. By focusing on these larger issues, he is helping to prepare the next generation of chocolate makers to think critically about their craft and its impact on the world.

In sharing his journey, he can highlight the broader significance of cacao—from farm to chocolate bar—and emphasise the importance of ethical sourcing, sustainability, and the value of supporting cacao-growing communities. Teaching students and

consumers about the interconnectedness of the cacao industry with global issues like fair trade, environmental sustainability, and social justice will help shape a new wave of chocolate artisans who are as passionate about the planet and its people as they are about their craft.

The Fellow's students will be inspired not only by the techniques and skills he'll teach them but also by the deeper values that shape the future of chocolate-making. It's wonderful that he is taking this experience and using it to expand the possibilities for others to learn and grow within the industry.

Organisationally

The Fellow's organisation is actively supporting the development of Bean to Bar short courses, along with a professional development program for educators. The Fellow has had initial discussions regarding integrating some Bean to Bar learnings into the Certificate IV in Patisserie program, the curriculum and assessment team has confirmed that we can include this content as additional learning, although it can't be included in assessments under the current training package

Looking ahead the organisation is excited to explore the possibility of a micro-credential to further formalise this knowledge. This initiative promises to enrich the educational experience and provide students with valuable insights into the chocolate-making process, while also fostering a deeper appreciation for sustainability in the industry.

Implemented changes

No changes have been made at this stage, but the Fellow has been asked to put forward a proposal for the above-mentioned courses, starting with a professional development program for the teachers, which will act as a pilot with the aim of developing it further for short courses.

Broader VET Sector

The Fellow is expecting a greater interest in his Fellowship as he disseminates his findings, therefore the impact on the sector is yet to be quantified. The Fellow also believes that after delivering a professional development program for VET educators it will heighten awareness and interest thus gaining traction.

There have been no changes to policies or methodologies at organisational or sector level to date. He anticipates this will change as his findings are disseminated.

Summary of impact from the Fellowship

This is yet to be determined or quantified, but as the findings are disseminated the Fellow expects data to be available through feedback and up-take of Bean to Bar short courses, and participation in professional development programs. This will give a good indication of interest and how well it has been received by the public, VET educators and industry. He anticipates this will be available in the first 12 months.

What has been developed as a result of the Fellowship

The Fellow has been asked to develop a proposal for a pilot program for Bean to Bar, initially as a professional development program for VET educators to be further developed into Bean to Bar short course/s

The plans for the future:

1. Develop a professional development program for VET educators
2. Develop Bean to Bar short courses
3. Incorporating the skills and knowledge into the Certificate IV in Patisserie program - SITHPAT018 Produce chocolate and confectionery unit

Further Impact

The Fellow is deeply passionate about fostering a more informed and conscious chocolate culture, this approach will assist the Bean to Bar craft chocolate sector grow and thrive. Public awareness and education play crucial roles in shaping consumer behaviour and elevating the value of ethical, sustainable practices in the industry. This can be in the form of factory tours and tastings and cover topics like fair trade vs direct trade and how it impacts the livelihoods of farmers, supply chain transparency and storey-telling are all important points to be included.

07

Sector Engagement (Dissemination)

Future actions

The table below outlines the events, presentations and projects the Fellow has delivered or planned thus far.

Date	Organisation/ Stakeholders	Event	Nature of presentation	Projects	Key Contacts	Future Actions
23.7.24	Victorian Skills Authority	VSA presentation	Cacao – from Bean to bar		Ann-Marie Butt	
18.10.24	International Specialised Skills Institute (ISSI) Victorian Skills Authority (VSA)	OctoberVET	Cacao – from Bean to bar Disseminating Fellowship findings		Tamara Loh Katrina Jojkity	
December 2024	William Angliss Institute	Research forum	Bean to Bar craft chocolate Disseminating Fellowship findings		Richard Scarf Melanie Williams	
December 2024	William Angliss Institute	Annual Conference	Bean to Bar craft chocolate Disseminating Fellowship findings		Richard Scarf Angela Tsimiklis	
April 2025	William Angliss Institute	Bean to Bar workshop	Professional development for William Angliss Institute staff		Richard Scarf Angela Tsimiklis	To use this workshop as a foundation to build Bean to Bar short courses

Date	Organisation/ Stakeholders	Event	Nature of presentation	Projects	Key Contacts	Future Actions
July 2025	William Angliss Institute	Bean to Bar workshop	Professional development for other VET educators		Richard Scarf Angela Tsimiklis	
July 2025	William Angliss Institute	Bean to Bar short courses	Delivery of first Bean to Bar Short course	Bean to Bar	Richard Scarf Angela Tsimiklis	To offer this course nationally and internationally
2025	William Angliss Institute			Develop micro- credential	Bhaskar Adeeb Angela Tsimiklis Richard Scarf	Initially offer internally To offer this course nationally and internationally
2025	William Angliss Institute			To incorporate the learnings into the existing Chocolate unit at William Angliss Institute	Richard Scarf Angela Tsimiklis	To have the learnings incorporated into the National qualification
2025	Jobs and Skills Councils' (JSCs) William Angliss Institute		To have findings included in the Certificate IV in Patisserie qualification	Incorporate learnings into the Certificate IV in Patisserie qualification	Richard Scarf Angela Tsimiklis	
2025	Jobs and Skills Councils' (JSCs) William Angliss Institute		To have findings used to develop an elective unit in the Certificate IV in Patisserie qualification	Bean to Bar craft chocolate – Elective unit	Richard Scarf Angela Tsimiklis	

08

Conclusion

In conclusion, the Fellow's comprehensive exploration of the Bean to Bar craft chocolate industry examined everything from cacao farming to the final chocolate-making process and uncovered a critical gap in education and training. The core ethos of the Bean to Bar movement revolves around producing high-quality, fine-flavour chocolate that is ethically sourced and sustainably grown.

The research has underscored the essential role of ethics, sustainability, and biodiversity conservation in shaping the future of the industry. As a growing and emerging sector, the Bean to Bar movement requires greater support in the form of education, training, and professional qualifications to ensure its continued growth and success. Access to education should include programs that cater for a broad spectrum of learners - from general public to industry professionals.

Additionally, government support could be instrumental in fostering the development of the

industry. This support might come in the form of grants for course development, subsidies for students, or policy reforms that recognise Bean to Bar chocolate as a legitimate and sustainable career path.

The Fellowship has inspired the Fellow to advocate for greater public awareness and to pursue reforms within the Vocational Education and Training (VET) sector. The Fellow is eager to share his passion for craft chocolate, ethics, and sustainability, contributing to a more informed, sustainable, and prosperous future for the Bean to Bar craft chocolate industry.

09

References

Perfect Daily Grind Newsletter, article on witches' broom

<https://perfectdailygrind.com/2019/05/what-is-witches-broom-how-does-it-affect-cacao/>

Dos Lagunas Hacienda Agroforestal

<https://www.doslagunas.cr/en#historia>

Nortico Farm

<https://norticofarm.com/the-farm/>
<https://www.ecolechocolat.com>

Del Caribe Chocolate

<https://chocolatecaribe.com>

Sibö Chocolate

<https://www.sibochocolate.com>

Britanica - Sustainability

<https://www.britannica.com>

Heirloom Cacao Preservation

<https://www.hcpcacao.org>

National geographic society - Biodiversity

<https://www.nationalgeographic.org>

Britanica - Agroforestry

<https://www.britannica.com>

Regenerative Agriculture

<https://www.britanica.com>

Chocolate tours in Costa Rica (ecolechocolat.com)

10

Appendices

Appendix 1. - Further comments received

Spencer Cacao – Mudgee, New South Wales

“I wish I could get staff with some skills and knowledge in chocolate making”

Chocolatier Australia - Melbourne

“This would be a good course for my staff to do, to understand where cacao comes from and how chocolate is made. Let me know when you have an accredited course up and running”.

Mörk Chocolate – Melbourne

The planning for the course, “what an opportunity for the industry!”.

Queen Emma – Papua New Guinea

“I think your course for Bean to Bar is what we would need for our staff development”.

The Cocoa Provider - Melbourne

“This is what the industry needs!”.



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