

A Farm-Made Product Line: Generating Revenue and Supporting Volunteer Work



Abstract

Collingwood Children's Farm (CCF), located in Melbourne, Australia, is a non-profit organization whose mission is to provide an environment for children to experience nature and help people experiencing adversity. They currently rely heavily on external funding but want to become more financially self-sufficient. The goal of our project was to develop a farm-made wooden product line to increase CCF's revenue and grow their mission. Based on visitor surveys, consultation with farm staff, and visits to local markets, we designed and prototyped a line of five viable products for the farm to manufacture and sell. These five products of varying complexity provide the basis for a training program we developed that allows volunteers with disabilities to learn woodworking.

Liaisons

David Lewis OAM
Nick Karavokiros

Advisors

Prof. Holly Ault
Prof. Stephen McCauley

Team Members

Michael Iberger, Josh Kleiman
Noah Pins, Michael Zembruski

December 14, 2022

This report represents the work of one or more WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on the web without editorial or peer review.



Collingwood Children's Farm: Identifying an Opportunity to Grow

Non-profit organizations are essential toward helping individuals in need, and they require revenue to support their missions and initiatives. Often, much of this revenue comes from government funding and donations, leaving organizations dependent on external funding and vulnerable to macroeconomic fluctuations. In Australia, non-profits receive 57.7% of their revenue from external sources such as government grants and donations.¹ When non-profit organizations generate their own revenue, they are more financially independent and have greater control over the success of their mission.²

Collingwood Children's Farm (CCF) is a public benevolent non-profit organization located in Abbotsford right outside of Melbourne, Australia's second-largest city. Their mission is to support people experiencing adversity, practice sustainable farming, and provide an environment for children to experience nature. To accomplish this, the farm offers volunteer opportunities to people struggling with substance abuse and people with cognitive or physical disabilities (Figure 1). These opportunities help build self-esteem while teaching valuable skills that help break cycles of unemployment. Additionally, they promote sustainable farming through a land management technique called

permaculture. Their outdoor space hosts a variety of events such as youth birthday parties, guinea pig petting, and educational workshops (Figure 2).³ The farm's mission to provide a place for children to experience the outdoors is especially important in Melbourne where there is a lack of green space. Melbourne is comprised of 9.3% public green space, significantly less than the 26% average in other major cities around the world.⁴

CCF is not financially self-sufficient because its internal revenue, or revenue generated by the farm through the sale of goods and services, is not enough to support its operations and mission without external funding such as government grants and donations. Even with the support of external funding, CCF suffered net losses in 2020 and 2021.⁵ To avoid a net loss in future years and help the farm extend its impact, CCF aims to implement additional revenue streams to offset its



Figure 1: Nick Karavokiros, the farm woodworker (left), and volunteers in the woodshop



Figure 2: Educational program at CCF

expenditures. Internally generated revenue streams will be more beneficial to CCF than externally generated revenue streams because they offer more control over funding. Additionally, according to CCF's website, *"while grants are a welcome addition to our budget, applying for them is a big task so we are trying to become more and more self-sufficient by raising funds ourselves."*⁶ One method to support CCF's mission of becoming more self-sufficient is to increase its revenue from the sale of merchandise.

The goal of this project was to develop a wooden farm-made product line for CCF to expand their impact by generating an additional revenue stream and supporting volunteer work. To accomplish this, we selected five market-viable products through field research and designed prototypes and manufacturing instructions to ensure the farm could make these products to sell. In conjunction with this, we developed a training program that gives

volunteers with disabilities the opportunity to build these products while learning woodworking and valuable life skills. The implementation of the product line and training program will help expand the farm's mission.

Internal Revenue: Helping Non-Profits Expand Their Mission

This chapter details the importance of financial sustainability for non-profit organizations and describes CCF's financial challenges over recent years. A farm-made product line is offered as a solution to generate additional revenue for the farm while creating opportunities for disadvantaged volunteers through a training program which teaches valuable woodworking and life skills.

Non-Profits Require Revenue to Grow Their Mission

Non-profit organizations require revenue to carry out their missions, and most of this revenue comes from government grants, donations, and the sale of goods and services. Every non-profit has their own model to generate revenue; however, having diversified financial backing with well-established revenue streams can help an organization be more successful. CCF does not currently generate enough revenue to support their expenditures and mission; generating additional internal revenue through the sale of merchandise is one opportunity to improve

their finances.

Non-Profit Economic Sustainability

A financially self-sufficient non-profit organization carries out its mission and all associated expenditures using only internally generated revenue with no external funding from government funding and donations. Financial self-sufficiency is an ideal state that offers the organization more control over funding, but in practice, is an unreasonable expectation. While external funding helps support non-profits, a sole reliance on it is not economically sustainable. Adding internal revenue streams can give non-profit organizations greater financial security to carry out their mission.²

The marketization of non-profits is the idea of becoming more commercialized and businesslike to produce revenue, but scholars debate the ethical nature of the concept. Opponents argue that marketization may lead to for-profits disguised as non-profits. Meanwhile, supporters argue that generating revenue without the financial support of government funding and donations allows organizations to grow and maintain success in the future.² Current trends show that more non-profit organizations are beginning to operate like businesses to generate revenue while remaining dedicated to their mission. In a survey from Slovakia and Czechia, over 75% of non-profit representatives claim self-financing does not take

away from their mission.² Organizations generate revenue by charging entry fees and selling merchandise, which can be immediately reinvested into the organization through paying employees, overhead, and program funding. Habitat for Humanity, a global organization that provides stable housing to low-income families, operates over 1000 stores that sold over US\$42M of products in 2019.⁷ The Salvation Army is a global non-profit that helps provide basic human needs such as food, clothing, and shelter without discrimination. Similarly, they made over US\$500M in sales in the US from their over 8000 national stores.⁸ These internal revenue streams help non-profit organizations become more financially self-sufficient to expand their impacts.

Collingwood Children's Farm Finances

As a non-profit, CCF uses its revenue to support its mission and the community. They invest in infrastructure to support school groups coming to the farm, sustainable farming, as well as programs to help disadvantaged individuals. However, CCF is not financially self-sufficient, meaning they rely on external revenue to support their mission. Historically, the farm receives external revenue from government grants and other donations. They generate internal revenue through entry fees, farm tours, membership fees, rentals, and the sale of merchandise at their shop. In 2018 and 2019, CCF

had enough revenue to support its expenses. However, because of the Covid-19 pandemic, the organization suffered financial losses of AU\$356K and AU\$86K in 2020 and 2021, respectively. As shown in *Figure 3*, the organization’s external revenue increased from AU\$404K in 2018 to AU\$1.2M in 2021. In the same time frame, their internal revenue decreased from AU\$1.1M to AU\$663K.^{5,9} Adding new revenue streams alleviates some of this financial pressure on CCF. Internally generated revenue streams offer greater control and growth of the organization. CCF recognizes that

this is important, stating in its strategic plan that “increased/diversified revenue is critical to supporting new ventures and programs and the staffing and infrastructure necessary for their successful delivery”.¹⁰ As shown in *Figure 4*, in 2019, 51.0% of CCF’s internal revenue was from entry fees, 26.4% from bookings and farm tours, 13.1% from rentals, and 9.5% from other categories. Within the other category, *the sale of merchandise made up only 0.5% of CCF’s internal revenue*, which has a significant opportunity to grow.⁹

A Farm-Made Product Line Provides Sustainable Revenue

The implementation of a farm-made product line serves as a new internal revenue stream to help fund CCF’s mission and support their goal of financial self-sufficiency. Products in such a line can be marketed as environmentally friendly and made of byproducts readily available at the farm. Other non-profit farms have generated significant revenue through the sale of products to help support their missions.

Edgar’s Mission is a non-profit farm located in Victoria, Australia that rescues animals and uses

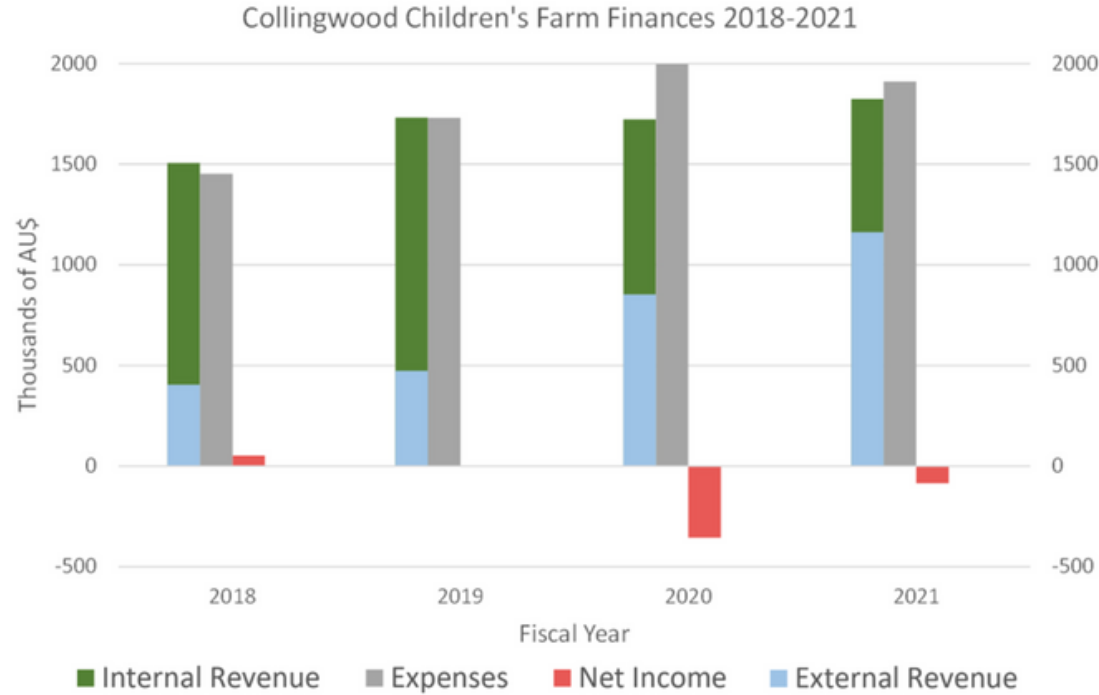


Figure 3: Finances of Collingwood Children's Farm in AU\$ from 2018 to 2021^{5,9}

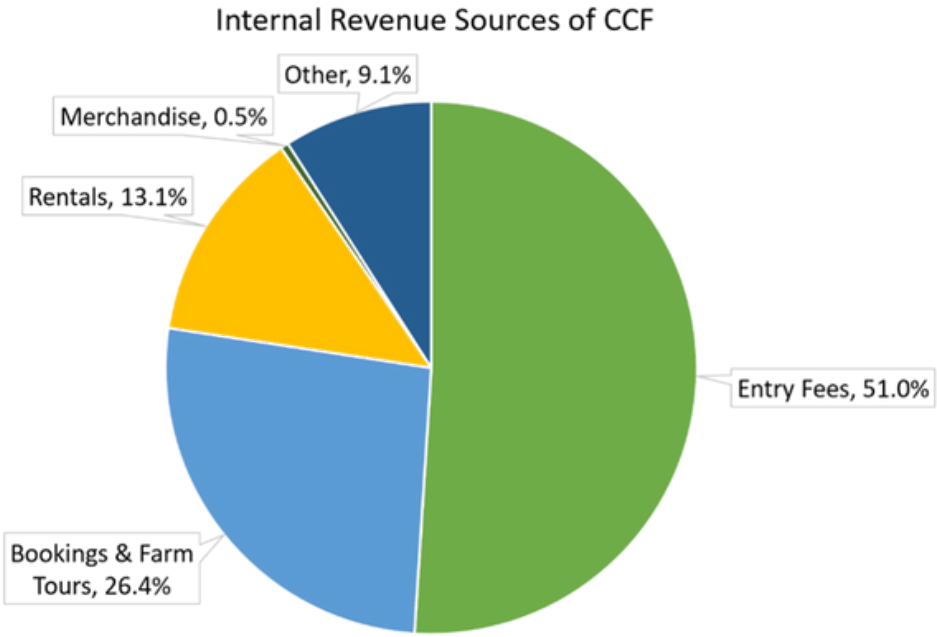


Figure 4: Internal revenue sources of Collingwood Children’s Farm in 2019⁹

its land as a sanctuary for them to live. They sell many environmentally sustainable products such as greeting cards, plush toys, and clothes for kids and adults on their website.¹¹ In 2021, the farm's sale of goods and services accounted for 29.8% of their total revenue.¹² This vital revenue is used to support their mission of rescuing and rehabilitating animals in need. Edgar's Mission demonstrates that a product line can provide revenue for the farm to support its mission.

A farm-made product line aims to address the financial problem at CCF, and the specifics of the product line can be determined through the engineering design process. This process outlines the necessary steps to create a farm-made product line while iteratively receiving feedback from all stakeholders. It details a thoughtful approach to solve a problem using six steps: identifying a problem, brainstorming solutions and selecting one, defining a project plan, designing models, developing the design, and launching the solution.¹³ The use of the engineering design process provided an effective method to address the farm's revenue problem.

The farm has the manufacturing capabilities to support a small product line through a woodworking shop (*Figure 5*) built during the Covid-19 lockdown. The woodshop, like the rest of the farm, is devoted to environmental sustainability



Figure 5: CCF woodshop

by using recycled materials such as donated pallets to produce its items. The shop is currently used to make equipment for the farm and provide a space for volunteers to work on hands-on projects.⁵

An Accessible Woodshop Engages Volunteers with Disabilities

One challenge many non-profits face is developing programs that both generate revenue and align with their mission. Often, programs that generate significant

revenue do not align with the organization's mission, while programs that align with the organization's mission do not generate significant revenue.¹⁴ In 2021, The Salvation Army generated only 11.3% of their total revenue in the United States from projects that support their mission.⁸ Non-profits must find a balance between generating revenue and supporting their mission because they are both crucial to the longevity of the organization.

Implementing a product line creates a great opportunity to both generate revenue and support the farm's mission of supporting individuals experiencing adversity. A woodworking training program aligned with the product line can be created where volunteers with disabilities can learn woodworking and valuable life skills. When developing the program, it is important to understand the demographic of volunteers to determine how to design appropriate safety protocols, tooling, and work instructions. Additionally, each volunteer responds differently to auditory, visual, and hands-on teaching methods and the program must be customizable to best suit the needs of each volunteer.

CCF Training Program Goals

Outside of developing woodworking skills, the goals of the training program are improving confidence, developing teamwork, and emphasizing effective communication. An effective way

to help build self-esteem for people with disabilities is to focus on staying positive, and set realistic attainable goals.¹⁵ Caringbah Craft Center is a successful woodshop in Sydney, Australia where participants with disabilities build wooden toys and decorations. They foster a collaborative environment where participants positively encourage each other to build self-esteem.¹⁶ This approach to building products and learning how to use new machines increases confidence and communication. SKIDZ Reimagined (Ohio, US) is a similar program where individuals with disabilities take and build custom orders, gain independence, and build confidence.¹⁷ Teaching methods used in these programs may be implemented at CCF to develop a successful training program.

Ensuring Safety in the Woodshop

Implementing comprehensive safety training, accessible tools, and clear work instructions will allow volunteers to successfully learn woodworking skills that may be used toward manufacturing products. Educating volunteers on the farm's safety protocols before using machinery in the shop will create an environment that minimizes risk and injury. Various devices improve safety and allow individuals to operate at a higher level of confidence in the woodshop. Fixtures, or devices used to hold a component in place while

completing an operation, are one type of equipment that may be used to prevent accidents and improve comfort level. Tool grips and clamped drill guides allow common tools to be more accessible and safer for people with disabilities.¹⁸ These devices increase stabilization for an individual completing an operation and make the tools more accessible.

Accessible tools may be substituted for more complex tools and complemented with clear, concise work instructions to help volunteers be more comfortable in the woodshop. Work instructions should use pictorials rather than words where appropriate to make the process more understandable. This makes it easier for individuals with cognitive disabilities to follow important directions.¹⁹ The use of accessible tools and clear work instructions will enable volunteers to have a more independent role in the woodshop.

Teaching Methods for Individuals with Disabilities

Everyone responds differently to visual, auditory, and hands-on learning methods. For individuals with cognitive disabilities, hands-on learning leads to better comprehension and retention of information than auditory or visual learning.¹⁹ Implementing hands-on activities (*Figure 6*) to teach skills in the woodshop allows each volunteer to understand how to use tools and machines.

Understanding each volunteer's specific needs will allow everyone to feel more comfortable and confident in the woodshop. The most effective results often come from strong communication, active feedback, and patience.²⁰ Clear, open communication between volunteers and supervisors creates a more personalized and beneficial experience for everyone. At Caringbah Craft Centre, they teach woodworking skills by catering to each participant's needs, allowing them to use the machines and skills they are interested in learning.¹⁶ Strong communication and tailored teaching methods will help the farm have an effective training program for volunteers.



Figure 6: Karavokiros using hand-over-hand teaching method with volunteer

Developing a Farm Made Product Line and Volunteer Training Program

The goal of this project was to develop a farm-made product line for Collingwood Children's Farm to expand their impact by generating an additional revenue stream and supporting volunteer work. This process was outlined by five objectives (Figure 7):

1. **Develop a comprehensive list of potential farm-made products**
2. **Define the criteria and constraints for product selection**
3. **Determine which products best satisfy criteria and constraints of the product line**
4. **Design products and manufacturing processes**
5. **Develop a training program for volunteers with ranging abilities**

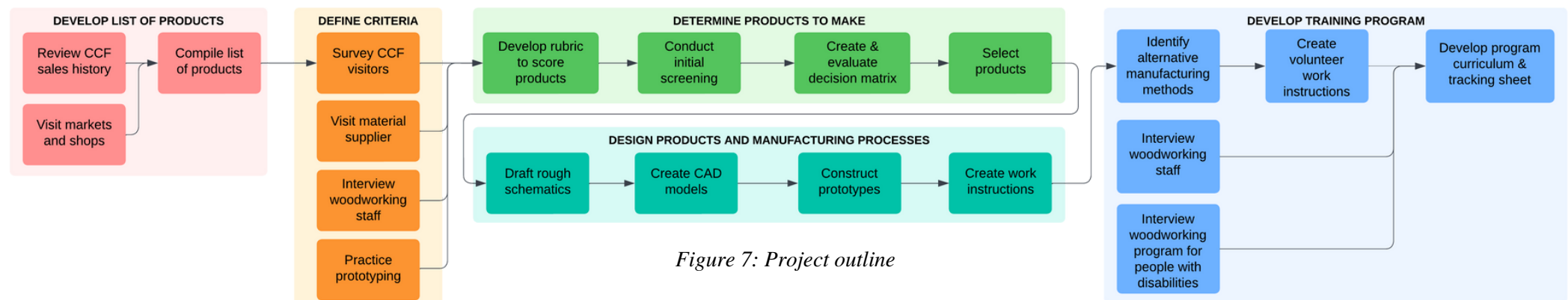


Figure 7: Project outline

Throughout our research, we gained valuable information from surveys with farm visitors, as well as interviews and discussions with Nick Karavokiros, the CCF Woodworking Lead, and David Lewis, the CCF Community Programs Coordinator. Karavokiros is an expert woodworker with over 20 years of experience at CCF working with people with disabilities. Lewis recently joined CCF and has worked with disadvantaged people for over 40 years (*See Supplemental Materials, H, Z for interview questions*). Additionally, to help us design the product line and training program, we interviewed local markets and a woodworking program for people with disabilities.

Develop a comprehensive list of potential farm-made products

We reviewed the sales history at CCF's shop and visited vendors selling wooden products to develop a comprehensive list of potential farm-made products.

Information from Karavokiros and a review of the sales data from the farm store allowed us to understand what wooden products were previously manufactured at CCF. The farm offers a program for children called Farmer for a Day that provides a farming experience through working with farm animals, gardening, and woodworking. Some popular products built through this program were small bonsai tables, picture frames, and finch boxes. Additionally, CCF's Square™ interface provided sales data from the wooden products currently available for sale in the farm shop (as of October 27, 2022) (*See Supplemental Materials, B*). The farm recently began producing cutting boards and finch boxes in the woodshop and selling them at the farm. Cutting boards made from offcuts generated AU\$55 in revenue in 2022 but took four hours to manufacture each unit and yielded a net loss of AU\$85. Finch boxes made from donated pallets generated AU\$332 in revenue and when accounting for labor costs, yielded a net income of

AU\$187 (Table 1). This implies finch boxes are viable products to sell at the shop, while cutting boards require a more efficient manufacturing process to be financially viable.

We visited and interviewed a variety of organizations (See Supplemental Materials, D-F) to develop product ideas, and learn about each of them. The products from each organization have varying origin stories: Country Roads Family Farm (Missouri, US) repurposes material from old barns to make their products; Woodcrafts Australia (Queen Victoria Market, Melbourne, AU) serves as an outlet for local crafters; and Dragonfly Toys (Abbotsford, AU) imports their products from European suppliers (Figures 8 and 9). Country Roads Family Farm runs a made-to-order business model, accepting orders for products ranging from shelves to picnic tables. At Woodcrafts Australia, cutting boards, clocks, kitchenware, and vases sell best. A variety of products for children are sold at Dragonfly Toys, but trains and animals are their best sellers. Additionally, the product catalogs of Amish Toy Box (Ohio, US), an online family-run

toy business, and Amazon, one of the largest online retailers in the world provided information on some of the best-selling wooden items online.^{22,23} Through interaction with each organization, we photographed and noted eighty-two wooden products that offered potential value to the product line (See Supplemental Materials, G). To organize the list and prepare for future data collection, we categorized each product into 13 different groups, e.g., games, outdoor, household.

Define the criteria and constraints for product selection

Lewis, Karavokiros, and farm visitors informed the identification of criteria and constraints for product selection: sales volume, manufacturability, net income per unit, marketability, and material availability. The selection criteria were then assigned a weight based on their ability to impact the feasibility and success of the product line.

Sales volume is one major factor that contributes to a product's ability to generate revenue for the farm, and data from visitor surveys determined this

Product	Material	Units Sold	Revenue per Unit (AU\$)	Labor Cost per Unit (AU\$)	Material Cost per Unit (AU\$)	Net Income per Unit (AU\$)
Cutting Board	Offcuts	1	55	140	0	-85
Finch Box	Pallet	17	19.53	8.75	0	11.25

Table 1: Sales breakdown of previously sold wooden products at CCF (Labor cost: AU\$35/hr)²¹



Figure 8: Wooden items at Woodcrafts Australia in the Queen Victoria Market



Figure 9: Wooden items sold by Dragonfly Toys located in Abbotsford

criterion. The survey used the 13 product categories from the initial list of products and prompted respondents to select the five categories they were most interested in purchasing products from (See *Supplemental Materials, I*). Additionally, respondents were asked if they preferred pre-built products or do-it-yourself kits. We conducted the survey (Figure 10) at CCF and the Abbotsford Farmer's Market, located next to the farm, and received responses from 107 individuals. Visitors were most interested in the kitchen, outdoor, furniture, and educational toy categories and much less interested in the health, souvenirs,



Figure 10: Noah conducting a survey with a visitor at CCF

storage, and pet categories (Figure 11). Additionally, 50% of respondents were interested in pre-built products, 34% were interested in do-it-yourself kits, and 16% were interested in both (See *Supplemental Materials, J*). This showed higher demand for pre-built products, so we decided to exclusively produce them for the pilot product line.

Some potential biases and limitations were present in this survey:

- Product categories displayed at the top of the list are read first, and therefore may be more likely to be selected
- The survey was potentially unrepresentative of the customer population because we only surveyed on one day.
- The survey instructions prompted respondents to select exactly five categories, however, some respondents selected fewer than five, while some respondents selected more than five. The level of attention given to instructions created variation in the results.

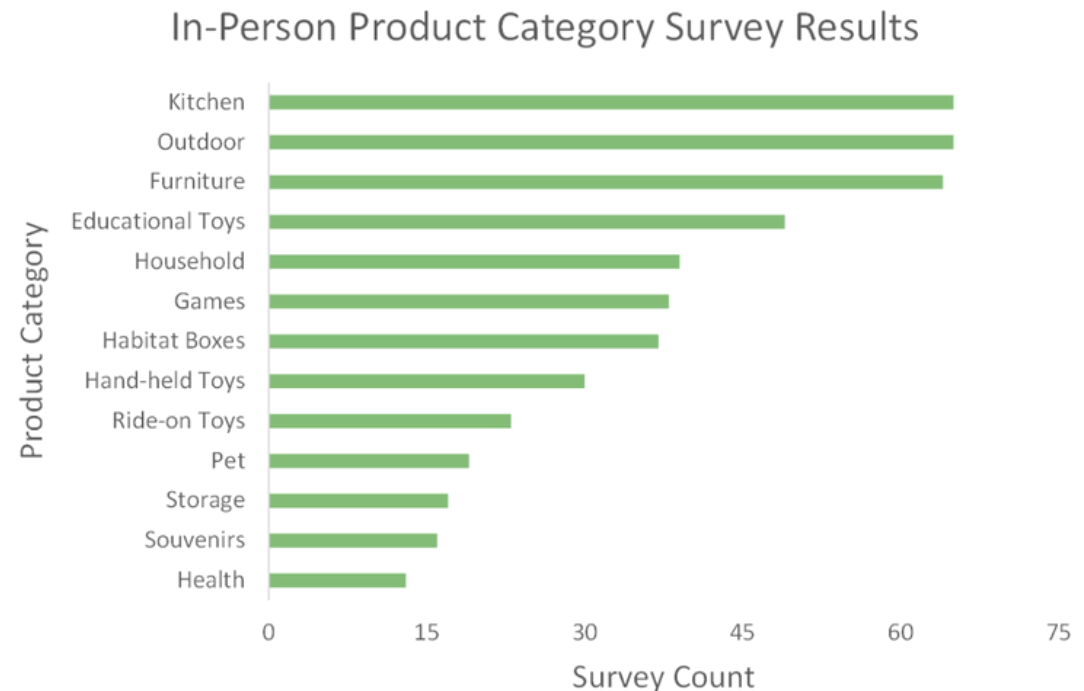


Figure 11: In-person product interest survey results

Despite these biases, the survey results remained conclusive, and the data determined the relative sales volume for each product.

We also conducted an online survey (See *Supplemental Materials, K*) through Qualtrics, a software offered through WPI, to reach more individuals and learn if online users had different interests from in person visitors. This survey included an additional question about interest level in purchasing items online, in-store, or both to gauge interest in an online shop. Randomizing the order of the displayed categories for each respondent, offering the survey across multiple

days, and implementing logic to enable respondents to only select one to five categories eliminated the potential biases and limitations present in the in-person survey. The survey was advertised on CCF's Instagram and Facebook accounts (*See Supplemental Materials, L*) and incentivized engagement by offering entry into a finch box raffle for those who participated. After a week, only 14 people responded to the survey, making the results inconclusive. One major bias present was that individuals who participated in the finch box raffle entry were more likely to be interested in the habitat boxes category, skewing our results. The results from both surveys also suggest it is more effective to collect data by directly engaging visitors in-person because there is more social engagement, and it is easier to emphasize the impact of the survey. Due to the limited response rate from online surveys, only relative sales volume projections based on the in-person survey results were considered.

To determine **manufacturability**, we interviewed Karavokiros about the experience level of the employees and volunteers and the available labor hours, tools, and equipment for the product line. Karavokiros has many responsibilities and has limited available time for new projects. Currently, Karavokiros receives help from James Morton, a carpenter by trade who has clearance to use most

tools in the woodshop. The woodshop also hosts many volunteers with varying abilities. They help with projects by using hand tools and bringing supplies to Karavokiros. Additionally, there is only twenty-one square meters of workspace and limited tools and equipment. The limited resources in the woodshop constrain which products can be manufactured at the farm.

We prototyped items expected to be market viable to gain hands-on experience with the resources in the woodshop and learned about the manufacturing complexity of various product types. First, a large planter (*Figure 12*) was prototyped using pallet wood to help us understand the available equipment, space, and materials at the farm. The assembly process was straightforward, however, due to the space constraints in the woodshop, prototyping the planter required relocating tables and equipment. This emphasized the manufacturing difficulties that come with producing large products in the woodshop. The planter was made from donated pallet wood, which was easy to work with, but is not viable for all products because it is lower-quality and only available in specific sizes.

Next, we attempted to prototype a toy tractor to learn about the capabilities of the woodshop to make smaller, more finely detailed products. A jigsaw was used to cut the tractor shape which



Figure 12: Large planter prototype

required difficult, high-precision cutting, and the drill press with a hole saw was used to cut the wheels. However, these operations were unsuccessful because the hole saw was too dull, and the chuck of the drill press fell off multiple times. Based on this experience, it is not feasible to make smaller products with the current equipment in the woodshop.

Net income per unit is another factor that contributes to a product's ability to generate revenue for the farm. It is based on estimates for the sales price, material cost, and manufacturing cost for each unit. Prices from Woodcrafts Australia

for each unit. Prices from Woodcrafts Australia and Dragonfly Toys, as well as similar products on Amazon, Etsy, and Amish Toy Box influenced the perceived fair market price for each product.^{22–26} Karavokiros provided information on the required material quality and manufacturing complexity of each product on the list, and this information provided the estimated material and labor costs. The projected net income per unit was based on fair market price, material cost, and labor cost data.

To determine **marketability**, we talked with Lewis and Karavokiros about values that are important to the farm and visitors. Products that have an environmentally friendly story of origin and support volunteer work are more appealing to customers. Farm-themed products, such as those



Figure 13: Donated pallets next to the woodworking shop

involving plants or animals, and products that can be used in practice at CCF will be easier to market to visitors.

Material availability depends on if a product could be manufactured out of donated pallet wood, or if it required non-wood external components and/or high-quality wood. Pallets are a free material for wooden products and CCF receives about 20 pallets biweekly (*Figure 13*) from various local companies that would otherwise dispose of them. We also visited CERES Fair Wood (*Figure 14*), a discount high-quality wood supplier, and learned about their product catalog. CCF has previously worked with CERES Fair Wood because they sustainably source materials from timber forests and salvaged timber which aligns with CCF’s mission of environmental sustainability.²⁷ This visit provided insight into the prices of high-quality material and the impact of material cost on our product selection. It is considerably more cost-effective to use donated pallet material where applicable.

We worked with Karavokiros and Lewis to determine the weights of each criterion (*Table 2*) based on their ability to generate revenue and support the farm’s values. Net income per unit and sales volume are important because they directly relate to the product’s ability to generate revenue and combined for a weight of 45%.



Figure 14: CERES Fair Wood inventory

Manufacturability and material availability are also important because they reflect the feasibility of making the product on the farm with low-cost materials and combined for a weight of 35%. The remaining 20% of the score is devoted to the product’s marketability to ensure that the product reflects the farm’s values and appeals to visitors.

Criteria	Weight
Sales Volume	25%
Manufacturability	25%
Profit per Unit	20%
Marketability	20%
Material Availability	10%

Table 2: Product line criteria and weights

Determine which products best satisfy criteria and constraints of the product line

We created a rubric with scores for each criterion, conducted an initial screening, and for each product that passed the screening, calculated a total score in a decision matrix using a formula-based Excel spreadsheet. The rubric (*See Supplemental Materials, M*) was based on our research about the importance of sales volume, manufacturability, net income per unit, marketability, and material availability. The total scores from the decision matrix allowed us to identify the products that were most likely to be successful in the product line.

The **rubric** (*Table 3*) **quantified our field research** of the factors that affect each criterion, scored from zero (worst) to three (best). This rubric was used to score criteria for each product in the decision matrix.

Before utilizing the decision matrix, we conducted an initial screening of each product. Any product that received a score of zero for at least one criterion failed and was removed from the list (*See Supplemental Materials, N*). The process saved time by reducing the number of product entries in the decision matrix. For the net income per unit criterion, products where the labor and material cost are greater than the revenue were removed. Products unlikely to sell well, for reasons such as being used only in niche scenarios, failed the sales volume

criterion. Twenty-nine products failed the manufacturability criterion and were removed for a variety of reasons, such as requiring compliance with strict safety regulations, being unsafe for children, or demanding complex manufacturing processes. Other products failed this criterion because CCF did not have adequate equipment to manufacture them. For the material availability criterion, products failed if they contained materials that were unavailable at local suppliers. Lastly, two products failed for marketability and were removed: boomerangs because they are culturally inappropriate and cigar boxes because they were deemed inappropriate for sale at a children's farm. After this screening, 34 of the original 82 products remained.

Criterion	Weight	Scored by	0	1	2	3
Sales Volume	25%	Percentile of product category in survey results	No market	<33%	33%-66%	<67%
Manufacturability	25%	Production time, product size, required tooling and personnel experience	Safety regulations, unsafe for children, infeasible to build	High-complexity	Low complexity, long production time	Low complexity, short production time
Net Income per Unit	20%	Fair market prices, labor costs, and material costs (AU\$)	Insignificant	\$1-\$25	\$26-\$75	>\$75
Marketability	20%	Ability to be farm-themed and advertised at farm	Inappropriate	Meets no factors	Meets one factor	Meets both factors
Material Availability	10%	Material quality and cost	Unavailable	High-quality wood	Non-wood external components	Donated pallets

Table 3: Criteria rubric for product scoring

We scored the remaining 34 products within the decision matrix (Table 4) based on our rubric.

While most criterion scores were input manually, the sales volume scores were calculated using an algorithm based on percentiles from the in-person product interest survey results. The criterion scores and total scores were conditionally formatted to visually represent the highest-scoring products (green) and the lowest-scoring products (red).

The 25 highest-scoring products in the decision matrix were considered as potential products for the line. We decided to prototype the five highest-scoring products that varied among three factors: product category, sales price, and manufacturing complexity. Having differing sales prices and product categories enables the product line to appeal to multiple audiences and socioeconomic

classes. Additionally, implementing different manufacturing complexities enables volunteers with varying woodworking experience to contribute to the manufacturing process. Based on these factors, we selected five products for the pilot product line: tabletop planter, finch box, kids table and chair set, rocking sheep, and cheese and cutting board set.

Weight:		25%	25%	20%	20%	10%	
Product	Category	Sales Volume	Manufacturability	Net Income per Unit	Marketability	Material Availability	Total Score
Tabletop planter	Outdoor	3	3	2	3	3	2.80
Balcony Planter	Outdoor	3	3	2	3	2	2.70
Kids Table & Chair Set	Furniture	3	2	3	2	3	2.55
Finch Box	Habitat Boxes	2	3	2	3	3	2.55
Building Blocks	Educational Toys	3	3	1	2	3	2.40
Cutting & Cheese Board Set	Kitchen	3	3	2	2	1	2.40
Bench	Furniture	3	2	3	2	1	2.35
Bar Stool	Furniture	3	2	3	2	1	2.35
Rocking Sheep	Ride-on Toys	2	2	3	3	1	2.30
Adirondack Chair	Furniture	3	1	3	2	3	2.30
Wagon	Ride-on Toys	2	2	3	2	2	2.20
Bed Tray	Furniture	3	3	2	1	1	2.20
Coaster	Kitchen	3	3	1	2	1	2.20
Cutlery Caddy	Kitchen	3	3	1	2	1	2.20
Coffee Table	Furniture	3	2	3	1	1	2.15
Tumbling Tower	Games	2	3	1	2	3	2.15
Toy Box	Educational Toys	3	2	2	1	3	2.15
Table	Furniture	3	1	3	2	1	2.10
Seesaw	Ride-on Toys	2	1	3	2	3	2.05
Dog House	Pet	1	2	3	2	3	2.05
Bee Box	Habitat Boxes	2	1	2	3	3	2.05
Trivet	Kitchen	3	3	1	1	1	2.00
Wine holder	Household	2	3	1	2	1	1.95
Shelf	Furniture	3	2	2	1	1	1.95
Clock	Household	2	2	3	1	1	1.90

Table 4: Completed decision matrix sorted from highest scoring (green) to lowest scoring (red)

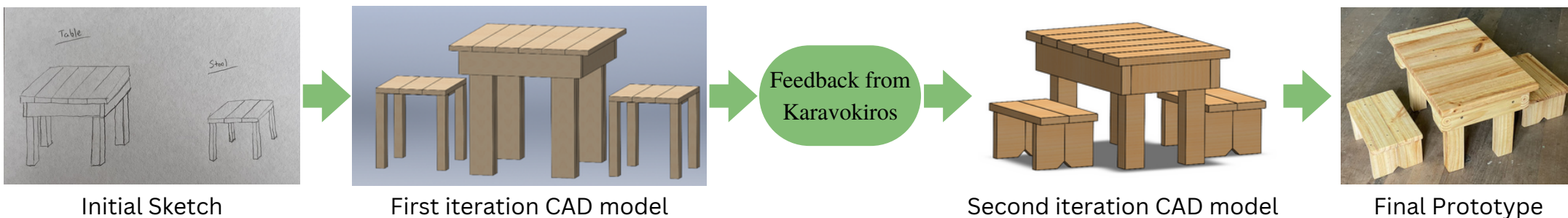


Figure 15: Design process used to create products

Design products and manufacturing processes

Following the process shown in *Figure 15*, we designed the tabletop planter, kids table and chair set, and cheese and cutting board set, and replicated viable designs previously created by Karavokiros for the rocking sheep and finch box. While prototyping, we documented the manufacturing process to create work instructions.

The initial sketches (*See Supplemental Materials Q*) allowed us to agree upon a preliminary design before developing the digital models. Then, we created digital models (*See Supplemental Materials R*) using Computer-Aided Design (CAD) in Solidworks™ to visually communicate the design of each product with dimensions. Next, we collected feedback on the designs from Karavokiros to ensure manufacturability, customer satisfaction, and quality. He proposed minor changes to help refine the final design for various products. For example, he suggested removing the hole in the

cutting board to decrease manufacturing complexity and shortening the cheese board handle to improve ergonomics. Based on Karavokiros' suggestions, we revised the designs and generated cut lists for the prototyping process.

Next, we prototyped each product (*See Supplemental Materials, S*) with Karavokiros in the woodshop and documented the manufacturing process. The first step in prototyping was to select materials based on the cut list. Then, Karavokiros worked with us to build each product in the woodshop. While prototyping, we used hard templates for the rocking sheep and cheese board as manufacturing guides in the woodshop.

The **finch box** was the easiest product to make and took only 15 minutes (*Figure 16*). The entire process involved making the parts on the cut list, drilling an entry hole, attaching all



Figure 16: Wooden finch box prototype

components together, and adding sticks for the inches to sit on. This process is accessible for volunteers with limited woodworking experience to help with.

The process to make the **cutting and cheese board set** required higher precision and was more difficult as it involved industrial and power tools such as the bandsaw, belt and disc sander, and hand router (*Figure 17*). The set required sanding and oiling, operations that do not require extensive woodworking experience and are both extremely accessible for volunteers with disabilities. The set took only two hours to make and based on the manufacturing complexity, it was the second easiest to make.



Figure 17: Wooden cutting board (top) and cheese board (bottom)



Figure 18: Wooden tabletop planter prototype

The **tabletop planter** was the next easiest to make and took two hours (*Figure 18*). The combination of having a larger product with more components made the manufacturing process more complex and less accessible to beginners. However, the individual steps were not complex and involved cutting pieces and attaching components together with the pin gun and impact driver. Therefore, most operations could be completed by a volunteer with minimal experience.

The second most difficult product to manufacture was the **kids table and chair set** which took seven hours to complete (*Figure 19*). The process was complex, involving two unique designs and requiring industrial tools such as the bandsaw, mitre saw, table saw, and planer. Since this product is used by children, a time-consuming deep sanding

and oiling process was required. However, the finishing operations along with many low-complexity assembly operations provide great opportunity for volunteers with less experience to participate in the manufacturing of this product. The table and chair set introduced us to an important aspect of the design process – modifying a design while prototyping. We decided to add support components to the chair because the original design lacked support, leading to decreased stability. Additionally, we created cutouts on the sides of the table because the original design did not allocate enough space for children to fit their legs between the chairs and table. Modifying a prototype creates more opportunities to improve the product during the design process.



Figure 19: Wooden kids table/chair set prototype

The most difficult product to make was the **rocking sheep** which took 10 hours to complete (Figure 20). It involved tracing six templates and cutting out each shape with the bandsaw. The assembly process required using wood glue which took overnight to dry. Additionally, each component required extensive sanding because children sit on this product. Once the components were attached, all holes and gaps were filled with putty to make the product more presentable, which also required sitting overnight to dry. While most operations required a higher level of experience, the more time-consuming operations such as sanding and applying putty did not. However, the sanding was more complex than other products because there were intricate shapes such as the sheep head. Based on this information, the rocking sheep was the most



Figure 20: Wooden rocking sheep prototype

difficult product to make, as it involved many higher complexity operations. This process helped us understand the experience required to use each tool and the time it takes to manufacture each product. Despite the unique challenges that occurred for each prototype, they were all successful and viable to reproduce. Additionally, developing the prototype took significantly longer than manufacturing multiple products simultaneously would with a reproducible process.

While prototyping, we documented the process and then **created formal work instructions** (See *Supplemental Materials, T-X*) to ensure each product has a reproducible manufacturing procedure. The work instructions contain a cut list; the required equipment, materials, hardware, and personal protective equipment (PPE); and a detailed description and image of each operation. A combination of both real-life photos and screenshots of the CAD model in each step (Figure 21)

<p>13</p>	<p>Attach planks to sleds: Use pin gun to attach the 4 planks (B) to the sleds (F).</p> <p>Use 2x 45mmx1.6 pins on each side for each piece.</p> <p>For pin placement, align pin gun visually with plank (B) and place pins about 7mm apart.</p> <p>End planks are 150mm from ends and each plank is 120mm apart.</p> <p>Pin layout shown in red.</p>	
-----------	--	--

Figure 21: Step 13 of rocking sheep work instructions

helps the reader visualize how to assemble the product, and how it should look in real life. Additionally, annotations on the images such as dimensions and arrows to show the exact location of specific components ensure consistency within each product. Each step includes a detailed description explaining the operation and the tools, hardware, materials, PPE, and components used. The instructions are made to be clear and concise to enable anyone with woodworking experience to create the designed product. After drafting instructions, Karavokiros confirmed their accuracy and readability.

After finishing each prototype, we surveyed visitors at CCF’s Abbotsford Farmers Market stand (Figure 22) to confirm interest in the pilot product line and collect general feedback (See Supplemental Materials, Y). Through the survey, respondents viewed the five prototypes on display, priced respectively, and noted which ones they would be likely to purchase (Figure 23). Prices of similar products at companies such as Etsy, Woodcrafts

Australia, and Dragonfly Toys, with an added premium to account for the products’ environmentally friendly origin determined each product’s price.^{24,25,26} Out of 59 respondents, visitors were interested in all products nearly equally (Figure 24), with the average count being 20, and a maximum deviation of four. Respondents could select as many products as they wanted and on average, they selected 1.8 each. Overall, the results confirmed the findings from the decision matrix; visitors were interested in all the prototypes displayed and we believe based on these results that the farm will find success selling all five products.



Figure 22: Michael, Josh and Noah (left to right) conducting the prototype interest survey at Abbotsford Farmers Market



Figure 23: Poster for the prototype interest survey at Abbotsford Farmers Market

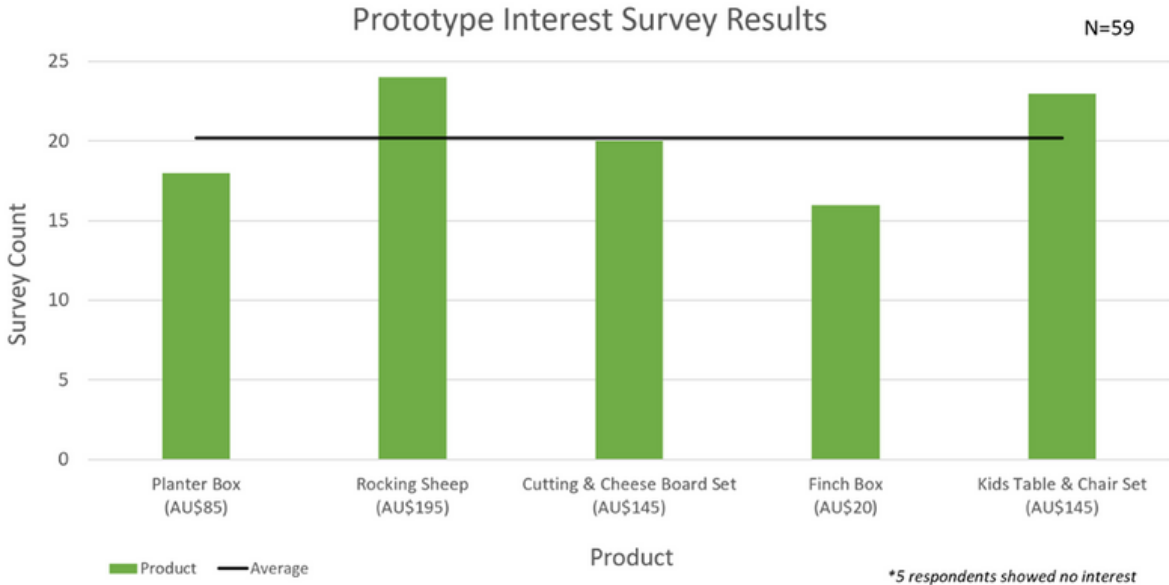


Figure 24: Prototype Interest Survey Results

Develop a training program for volunteers with ranging abilities

To help promote the farm's mission of supporting volunteer work, we created a comprehensive training program for volunteers with disabilities. This program serves to teach individuals how to use the tools in the woodshop, and help them gain confidence, improve communication, and learn teamworking skills. The program uses the five selected products as teaching tools, as each has a unique manufacturing process that enables volunteers to learn a variety of skills in the woodshop. The completed training program consists of an initial safety orientation, lessons guided by accessible work instructions, an associated matrix of alternate tools to accompany the instructions, a detailed curriculum to facilitate volunteer education, and a tracking sheet for each volunteer.

We interviewed Karavokiros (*See Supplemental Materials, Z*) to learn about the current safety practices in the woodshop and CCF's vision for the training program. The farm follows standards set by OH&S (Occupational Health and Safety) and local schools to educate volunteers in the woodshop and ensure safe practices. Karavokiros believed the implementation of individual lessons for volunteers with different experience levels would help them comfortably learn at their own pace. Also,

volunteers best retain information through a combination of hands-on, auditory, and visual teaching (*Figure 25*).

To enhance the training program, we wanted to learn about successful woodworking programs for individuals with disabilities. This prompted an interview (*See Supplemental Materials, AA*) with Michelle Madden, the Site Manager at Caringbah Craft Center. They are a woodshop program where participants with cognitive and physical disabilities learn woodworking skills by creating marketable products. The center teaches participants at their own pace one tool at a time using the hand-over-hand technique. They start with low-complexity activities such as sanding, and then progress to

high-complexity activities such as using the bandsaw. The program fosters a positive environment with a culture among participants of encouraging each other to boost confidence and promote teamwork. This information helped us design the training program at Collingwood Children's Farm.

The training program begins with a safety orientation covering standards outlined in the OH&S book and strategies used at local schools, which Karavokiros is trained to teach. This provides volunteers with an overview of woodworking, and after completing this orientation, they may begin to learn specialized skills.



Figure 25: Karavokiros woodworking with volunteers at CCF

The training program consists of **lessons for volunteers that teach valuable woodworking skills**. These lessons use the five products selected for the product line and their associated work instructions as teaching tools. The master work instructions, made for an experienced woodworker, detail the most effective tool and process to complete each operation. However, the woodshop has lower-complexity tools which can be used to complete certain operations. This training program uses these lower-complexity tools as a starting point to teach volunteers woodworking through the process of making products.

This ability to complete operations using a variety of tools is reflected in a set of volunteer work **instructions designed specifically for volunteers** to use as a visual aid (*See Supplemental Materials, AB-AF*). We designed these instructions for individuals of any skill level with the guidance of a supervisor experienced in woodworking, such as Karavokiros. We discussed with Karavokiros the best methods to communicate information with volunteers through these instructions. The volunteer instructions have a few key differences from the master versions. For instance, power and industrial tools are omitted when there are alternative options because they may cause those who are not experienced enough to use them to feel discouraged (*Figure 26*). Additionally, the list of required tools

is removed from each set of volunteer instructions to allow for alternative methods of completion. For the same reason, the list of available tools will not be seen by volunteers. Additionally, not all volunteers are literate, so to accommodate for this, the components in the work instructions are named, labeled and shown in images. The volunteer instructions accommodate any volunteer, regardless of experience level, to manufacture each product, or some portion thereof, and learn the woodworking skills offered through the program.

Certain operations throughout the instructions can be completed with **alternative tools** (*Supplemental Materials, AG*), allowing for volunteers with varying experience levels to gain hands-on experience with manufacturing each product. This increases accessibility by enabling someone who is not trained in using the industrial-scale equipment to complete a task using the equivalent hand or

Sand top of table:
Use handheld belt sander to sand top of table until all pieces are flush.



Sand top of table until all pieces are flush.



Figure 26: Master work instructions (top) vs. volunteer work instructions (bottom)

power tool (*Figure 27*). For example, while a bandsaw may be the most efficient method of cutting the shape of a cheese board, a jigsaw or coping saw are also viable methods.

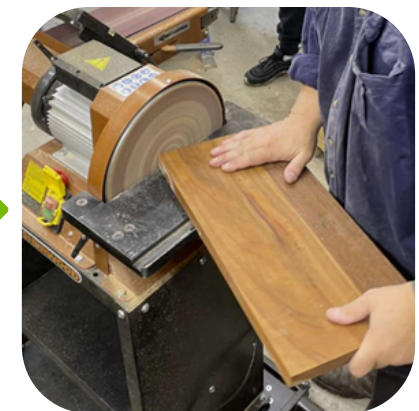


Figure 27: Alternative sanding methods from easy (left) to difficult (right)

The **training program curriculum** (Figure 28) outlines the process for becoming competent in each tool. The supervisor will use this as an instrument to guide the sequence in which volunteers practice using each tool, categorized by both operation type, such as cutting and finishing, and equipment type such as hand, power, and industrial.

The curriculum shows the steps in the work instructions that use each tool, color-coded based on the product. Most work instructions steps for a given tool have similar difficulties and are therefore listed from left to right in the order of product complexity. Volunteers may complete these operations in any order. However, some tools (marked by *), such as powered sanders and jigsaws, have work instruction steps with differing

Product Line Training Program Curriculum			Key											
<i>*sorted low-complexity (left) to high-complexity (right).</i> <i>All operations for tools not marked with (*) have the same complexity</i>			Finch Box											
			Cutting Board											
			Cheese Board											
			Planter Box											
			Kids Chair											
			Kids Table											
			Rocking Sheep											
Operation Type	Equipment Type	Tool	Step Number in Work Instructions											
Cutting (length)	Hand	Hand Saw	1	1	1	1	10	1	1	1				
Cutting (length)	Hand	Wire Cutters	12											
Cutting (precision)	Hand	Coping Saw*	3	2	3									
Cutting (precision)	Power	Jig Saw*	3	2	3									
Cutting (precision)	Power	Hand Router	3	6										
Cutting (width)	Power	Track Saw	1	1	1	1	1	1	1					
Cutting (length)	Industrial	Mitre Saw	1	1	1	1	10	1	1	1				
Cutting (precision)	Industrial	Band Saw*	2	3	4									
Cutting (precision)	Industrial	Table Router	3	6										
Cutting (thickness)	Industrial	Planer	1	1	1	1	1	1						
Cutting (width)	Industrial	Table Saw	1	1	1	1	1	1						
Drilling	Power	Power drill	2	11	2	3	5	8	3	6	5	23		
Fastening	Hand	Hammer	9											
Fastening	Power	Staple Gun	10											
Fastening	Power	Pneumatic Pin Gun	4	5	6	7	8	9	8	9	10	5	9	13
Finishing	Hand	File	10	11										
Finishing	Hand	Hand Sanding*	11	5	12	10	11	12	10	6	8	3	12	27
Finishing	Hand	Oiling	6	9	12	13	28							
Finishing	Hand	Wood Putty	26											
Finishing	Power	Powered Sanders*	11	4	7	12	10	12	11	6b	10b	7b	18b	
Finishing	Industrial	Belt & Disc Sander*	2	4	6a	7a	18a	10a	5					
Joining	Hand	Wood Glue	8	14	16	19	21							
Measuring	Hand	Ruler	10	7										
Measuring	Hand	Sliding Square	2											
Product Assembly	None	Selecting Wood	0	0	0	0	0	0	0					
Product Assembly	Hand	Trigger Clamp	5	3										
Product Assembly	None	Reading Work Instructions & Drawings	0	0	0	0	0	0	0					
Product Assembly	None	Pencil	2	2	2	7	8	2	2	5				
Screwing	Power	Impact Driver	3	4	6	7	11	4	6	9	4	7	24	

Figure 28: Training program curriculum

complexities. These tools have steps sorted from left to right in order of complexity, and volunteers should learn the tool in this order. For example, the sequence to learn hand sanding begins with sanding flat surfaces, such as the cutting board, and progresses to more complex surfaces such as the head of the rocking sheep. Within each operation type, participants must become proficient using the hand tool(s) before learning the power tool(s), and then the power tool(s) before learning the industrial tool(s). It will be up to Karavokiros' discretion as to when a volunteer is prepared to proceed to the next lesson. This creates an environment for volunteers to comfortably learn at their own pace. However, volunteers can choose to learn hand tools in any operation type at any time, enabling them to customize their learning experience.

Along with the curriculum and volunteer work instructions, there is also a **tracking sheet for each volunteer** (Figure 29). This tracking sheet is for the use of supervisors, and volunteers will never see their sheet. It includes a comprehensive list of every possible tool/skill used in the five products, and supervisors may mark when a volunteer is proficient at their discretion. This allows supervisors to keep track of a volunteer's progress and will inform their decision about when a

volunteer is eligible to proceed to more difficult tools.

The training program encourages collaboration which provides volunteers with an opportunity to gain confidence and improve team working and communication skills. Since volunteers can select the skills that they are interested in learning, different volunteers will be proficient in unique skills. This enables them to work

together on manufacturing products and build confidence as they see the impact of their work. SKIDZ Reimagined, a successful woodworking program for people with disabilities, described completing and selling a product and increasing the confidence of an individual, and gives them pride in their work.¹⁷ This same idea will be present in the CCF program, as manufacturing items for sale at the farm helps volunteers gain confidence and provides them with gratification.

The program uses visual, auditory, and hands-on teaching methods to cater to volunteers with a range of abilities to promote the most effective learning experience, as both Karavokiros and Madden suggested. The work instructions help the volunteers visualize the product at each stage of the manufacturing process. Additionally, the prototypes will be in the woodshop to show the volunteers what the final product looks like and help them understand how the part they are working on fits into the product. Throughout the process, Karavokiros explains how to use each machine to engage auditory learning. Additionally, Karavokiros will use a hand-over-hand technique and provide volunteers with a hands-on learning experience. The implementation of multiple teaching methods will help volunteers with a variety of learning styles gain valuable woodworking and life skills.

Woodshop Skill Tracking Sheet						
Name: _____						
Operation Type	Equipment Type					
	None/Hand	Proficient?	Power	Proficient?	Industrial	Proficient?
Cutting	Coping Saw		Jig Saw		Band Saw	
	Hand Saw		Track Saw		Mitre Saw	
	Wire Cutters		Hand Router		Table Saw	
					Table Router	
					Planer	
Drilling			Power Drill			
Fastening	Hammer		Staple Gun			
			Pneumatic Pin Gun			
Finishing	Hand Sanding		Powered Sanders		Belt & Disc Sander	
	Files					
	Oiling					
	Wood Putty					
Joining	Wood Glue					
Measuring	Ruler					
	Sliding Square					
Product Assembly	Pencil					
	Selecting Wood					
	Trigger Clamp					
	Reading Work Instructions & Drawings					
Screwing			Impact Driver			

Figure 29: Woodshop skill tracking sheet

The farm-made product line will have a strong, lasting impact on Collingwood Children’s Farm and the community it serves. After suffering a net loss over the past two years, the product line offers an opportunity for the farm to generate more internal revenue to help meet their needs. Selling the products that were selected by thorough evaluation and validated in a visitor survey sets the farm up to increase its annual revenue. The prototypes and work instructions enable the products to be reproduced in the woodshop for sale at the farm. Furthermore, the associated training program expands on the farm’s mission of supporting individuals experiencing adversity. The product line and training program combine to generate revenue for the farm and help the continued growth of the farm’s mission.

Expanding the Product Line’s Impact

Our team developed a set of recommendations for CCF to expand the impact of the product line.

Growing the Product Line

We recommend that the farm adds products to the line as it grows. Through the decision matrix, we identified 20 products (*Table 5*) outside of the five selected for the pilot product line that are market viable and feasible to manufacture with the

equipment currently available at CCF. It would be useful for the farm to consider the popularity of the five existing products and manufacturing complexity of the other 20 products when considering the order to incorporate these into the line.

Our first visitor survey showed that around 50% of visitors were interested in kits, suggesting that the customer base would increase if the farm implemented **do-it-yourself kits** that allow consumers to easily assemble some of the products from the line. The finch box and tabletop planter are capable of being sold as kits because they have low-complexity assembly processes and limited finishing operations. Kitting these two items first would be easiest, as we have already designed them as pre-built products. Additionally, the Adirondack chair and doghouse are feasible kits from our list of additional viable products.

The farm could sell variations of the finch box and rocking sheep to expand the demographic of customers. The sheep head can easily be substituted for any animal such as a horse, unicorn, or even a tractor.

List of 20 Additional Viable Products			
Balcony Planter	Bench	Cutlery Caddy	Toy Box
Adirondack Chair	Building Blocks	Dog House	Trivet
Bar Stool	Clock	Seesaw	Tumbling Tower
Bed Tray	Coaster	Shelf	Wagon
Bee Box	Coffee Table	Table	Wine holder

Table 5: List of 20 Additional Viable Products

The finch box can be adapted to be a bee box, a bat box, or a birdhouse for a different type of bird by exchanging the front piece (*Figure 30*). These variations help products that are already designed become marketable to a wider array of customers.



Figure 30: Bat box

Expanding the Manufacturing Capabilities

A greater volume and variety of products could be made by **expanding the manufacturing capabilities** of the woodshop. Through prototyping, we learned that the woodshop has limited equipment, space, and personnel. As the product line expands, we recommend CCF leadership allocate additional resources to support the growth of the woodshop. The acquisition of a lathe and new hole saw set, along with maintenance on the drill press, would enable 18 of the products that failed our initial screening to be manufactured (*See Supplemental Materials, N*). Additionally, more space could be allocated to the woodshop to allow for a greater production output. Lastly, Karavokiros has limited time available to make products, and the production volume will be constrained by his availability. To enable Karavokiros to dedicate more time to the product line and training volunteers, **we recommend the farm hires another expert woodworker** to assume some of his responsibilities. Although the farm has limited financial resources, the addition of another woodworker would increase the capabilities of the product line.

Developing Educational and Corporate Programs

The product line could be used as an educational tool for visitors that encourages collaboration and improves visitor experience. CCF currently conducts team building exercises with school and corporate groups, doing hands-on activities such as gardening and cleaning. The farm's programs manager could integrate the woodshop into these programs. The head of woodworking would lead groups to build various products while adjusting the equipment used based on experience level. Additionally, this experience can be available to the general public as a paid activity.

Accommodations for Volunteers

The training program and volunteer work instructions detail how volunteers can help build products in the woodshop. However, there are **additional accommodations that the woodworking lead can implement** so volunteers feel more comfortable with machines and prevent injury. For example, a mitre box can be used with a hand saw to keep lines straight and prevent a volunteer's hand from slipping and reduce the risk of injury (*Figure 31*). Fixtures such as drill guides can be used to increase stability while keeping holes straight

and in the correct position. A vice with rubber grips can be used to hold products, such as the cutting board, in place while sanding. The farm can implement fixtures and other manufacturing tools to boost the effectiveness of the training program and help volunteers be more successful and confident.

Increasing Customer Reach Through Marketing

The farm could bundle products, implement multiple sales channels, and improve advertising techniques to reach and appeal to more people. Through these marketing techniques, the revenue that the product line generates will increase.



Figure 31: Mitre box in the farm woodshop

One method to make products more desirable is to **bundle products with items that are often used with them**. For example, we suggest that the farm sells plants with the tabletop planter, and seasonal vegetables with the cutting board. This would increase the price that each product is sold for to generate additional net income per unit.

We strongly recommend the farm implement multiple sales channels to provide greater visibility to the product line. At their stand at the Abbotsford Farmer's Market, they currently only sell vegetables and plants, however, they could also sell their merchandise here to increase exposure (*Figure 32*). Additionally, they should add an online store to their website to appeal to a larger, more diverse audience. Every market we visited and interviewed had an online shop, and **80% of Dragonfly Toys' (a local wooden toy store) revenue comes from online sales**. This suggests that there is a wider market for these products that in-person sales alone do not reach.

The marketing lead could **implement enhanced advertising techniques** to help the farm reach individuals who may be interested in purchasing a product. One method to achieve this is to

show the products in use around the farm. For example, we suggest serving food on cheese boards at the farm cafe and placing rocking sheep and kids table and chair sets in the barn where children play. Additionally, we suggest advertising the product line on the CCF Instagram and Facebook accounts, where they



Figure 32: CCF stall at the Abbotsford Farmers Market

have a combined follower count of over 30,000. Through this advertising, it would be beneficial to emphasize that these products are made from recycled materials with the help of volunteers from disadvantaged populations. These two factors regarding social enterprise enable the product to be sold at a premium price, maximizing revenue generated.

Acknowledgements

Our team would like to thank our liaison, Collingwood Children's Farm, specifically Nick Karavokiros and David Lewis for their guidance, input, and hospitality throughout our time in Melbourne.

We would also like to thank our interviewees and survey respondents for taking the time to provide valuable information for the project.

Lastly, we would like to thank our advisors, Professors Holly Ault and Stephen McCauley, for their gracious support and guidance throughout the project.

Supplemental Materials for this project may be found at <https://wp.wpi.edu/melbourne/>

References

1. ACNC. (2022). *Australian charities report - 8th edition*.
<https://www.acnc.gov.au/tools/reports/australian-charities-report-8th-edition>
2. Vaceková, G., & Svidroňová, M. (2016). *Nonprofit organizations in selected CEE countries: A journey to sustainability*. Masarykova univerzita.
<https://doi.org/10.5817/CZ.MUNI.M210-8188-2016>
3. Collingwood Children's Farm. (2022). *Collingwood Children's Farm – Independent non-profit working farm supporting people who are experiencing adversity, through a range of programs*.
<https://farm.org.au/>
4. World Cities Culture Forum. (2022). *% of public green space*.
<http://www.worldcitiescultureforum.com/data/of-public-green-space-parks-and-gardens>
5. Collingwood Children's Farm. (2021). *Collingwood Children's Farm 2020-21 annual report*. <https://farm.org.au/wp-content/uploads/2022/06/CCF-Annual-Report-2021-1.pdf>
6. Collingwood Children's Farm. (2022). *Funding*.
<https://farm.org.au/about-the-farm/funding/>
7. Habitat for Humanity. (2019). *Annual report FY2019: Global impact*.
<https://www.habitat.org/multimedia/global-impact-2019/>
8. The Salvation Army. (2022). *2022 annual report | The Salvation Army USA*.
<https://www.salvationarmyusa.org/usn/2022-annual-report/>
9. Collingwood Children's Farm. (2019). *Collingwood Children's Farm 2018-19 annual report*. <https://farm.org.au/wp-content/uploads/2020/01/annual-report-2019.pdf>
10. Collingwood Children's Farm. (2022) *Strategic plan*. <https://farm.org.au/about-the-farm/governance/strategic-plan/>
11. Edgar's Mission. (2019, October 22).
<https://edgarsmission.org.au/>
12. ACNC. (2022). *Edgar's Mission limited*.
<https://www.acnc.gov.au/charity/charities/35104d9b-38af-e811-a95e-000d3ad24c60/documents/>
13. Lasser, R. (2022). *Electrical and computer engineer design handbook: An introduction to electrical and computer engineering and product design by Tufts ECE students*. Tufts University Press.
14. Levine Daniel, J., & Kim, M. (2018). The scale of mission-embeddedness as a nonprofit revenue classification tool: Different earned revenue types, different performance effects. *Administration & Society*, 50(7), 947–972.
<https://doi.org/10.1177/0095399716647152>
15. Voigt, R. J. (2018, July 26). “Who me? Self-esteem for people with disabilities.” *BrainLine*.
<https://www.brainline.org/article/who-me-self-esteem-people-disabilities>
16. Sylvanvale. (2022). *Caringbah Craft Centre - Sylvanvale*. <https://www.sylvanvale.com.au/services/community-hubs/caringbah-craft-centre/>
17. Knodel, L. (2017, June 14). *Woodworking program helps adults with developmental disabilities*. Journal-News.
<https://www.journal-news.com/news/local/woodworking-program-helps-adults-with-developmental-disabilities/fcka7Axp80IW1Vu1kdTmJP/>

18. Stout, D. (2022, September 29). *Best adaptive tools for DIYers with disabilities*. Family Handyman. <https://www.familyhandyman.com/list/adaptive-tools-disabilities/>
19. Job Access. (2018, July 13). *Cognition – managing learning and applying, understanding and comprehension in the workplace*. Department of Social Services. <https://www.jobaccess.gov.au/cognition2>
20. DO-IT. (n.d.). *Strategies for working with people who have disabilities*. University of Washington. <https://www.washington.edu/doit/strategies-working-people-who-have-disabilities>
21. Payscale. (2022, September 8). *Average master carpenter hourly pay in Australia*. https://www.payscale.com/research/AU/Job=Master_Carpenter/Hourly_Rate
22. AmishToyBox. (2022). *All toys – wooden toys*. <https://www.amishtoybox.com/collections/wooden-toys>.
23. Amazon.com. (2022). Amazon.com. *Spend less. Smile more*. <https://www.amazon.com/>
24. Etsy. (2022). *Shop for handmade, vintage, custom, and unique gifts for everyone*. <https://www.etsy.com/>
25. Dragonfly Toys. (2022). *Keeping the magic of childhood alive*. <https://www.dragonflytoys.com.au/>
26. Woodcrafts Australia. (2022). <https://www.woodcraftsaustralia.com/>
27. CERES Fair Wood. (2022). *Our timber selection criteria*. <https://ceresfairwood.org.au/pages/our-timber-selection-criteria>