



# BeeCause

## Connecting Beekeepers & Farmers

### Team 1: ELPP Fall 2022



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# Introduction





















The relationship between the world's growing population and its food supply is a matter of prime importance. The food industry depends heavily on agriculture. Pollination is the highest agricultural contributor to yields worldwide, contributing far beyond any other agricultural management practice. Most of the world's seed plants need to be pollinated. For crop pollination to be effective, timing is everything! Not only does the crop have to be in bloom but it must be accessible to its pollinators.

Researchers differentiate crops into categories using a scale of pollinator dependence. This ranges from having no dependency, to pollinators being essential. Table 1 shows the different food that depends on pollinator insects. (Ritchie, 2021). One of the most common pollinator insects are the bees and they are essential to the production of many of the micro-nutrient rich fruits, vegetables, nuts, seeds and oils we eat. In fact, close to 75 percent of the world's crops producing fruits and seeds for human consumption depend, at least in part, on pollinators for sustained production, yield and quality. But alarmingly, in a number of regions, pollination services are showing declining trends. In the past, this service was provided by nature at no apparent cost. As farm fields have become larger, agricultural practices have also changed, focussing on a narrower list of crops and increasing the use of pesticides. Mounting evidence points to these factors as causes to the potentially serious decline in populations of pollinators. (Why Bees Matter, 2018)

Crops such as mangoes in tropical regions, or almonds or cherries in temperate regions, have periods of mass blooming over relatively short time spans, requiring a tremendous peak in pollinators. Alternate resources are sometimes needed to fully support pollination services during crop flowering. This could entail shipping pollinators (like bees) into the crop area. Beekeepers play a huge role in enabling pollination by having their bees in the farms that need them. The role of bees and beekeepers is critical to agriculture not only in the US, but also globally. With improved pollination management, crop yields could be further increased by about 25 percent and we could contribute to several of the UN's Sustainable Development Goals.

# How dependent are foods on pollinator insects?

Our World  
in Data

<p><b>No dependency</b> Yields are not affected by pollinators</p>	<ul style="list-style-type: none"> <li> <b>Cereals:</b> wheat, maize, rice, sorghum, barley, rye, millet, oats</li> <li> <b>Roots and tubers:</b> cassava, potatoes, sweet potatoes, carrots</li> <li> <b>Legumes</b> including lentils, peas, chickpeas</li> <li> <b>Fruit and veg</b> including bananas, pineapples, grapes, lettuce, pepper</li> <li> <b>Sugar crops:</b> sugar cane and sugar beet</li> </ul> <p><small>Also includes: areca nuts, asparagus, cabbages, castor oil seed, cauliflower, chicory roots, dates, garlic, hazelnuts, jojoba seeds, leeks, olives, onions, pistachios, quinoa, spinach, taro, triticale, walnuts, yams.</small></p>
<p><b>Little dependency</b> Yield reduction of 0% to 10% without pollinators</p>	<ul style="list-style-type: none"> <li> <b>Fruit and veg</b> including oranges, tomatoes, lemons, limes, papayas</li> <li> <b>Oilcrops</b> including palm, poppy seed, linseed, safflower seed</li> <li> <b>Legumes</b> including beans, cow peas, pigeon peas</li> <li> <b>Groundnuts</b></li> </ul> <p><small>Also includes: bambara beans, chillies, grapefruit, persimmons, string beans</small></p>
<p><b>Modest dependency</b> Yield reduction of 10% to 40% without pollinators</p>	<ul style="list-style-type: none"> <li> <b>Oilcrops</b> including sunflower seed, rapeseed, sesame, mustard seed</li> <li> <b>Soybeans</b></li> <li> <b>Fruits</b> including strawberries, currants, figs, gooseberries, eggplant</li> <li> <b>Coconuts and okra</b></li> <li> <b>Coffee beans</b></li> </ul> <p><small>Also includes: broad beans, karite nuts, seed cotton</small></p>
<p><b>High dependency</b> Yield reduction of 40% to 90% without pollinators</p>	<ul style="list-style-type: none"> <li> <b>Fruits</b> including apples, apricots, blueberries, cherries, mangoes, peaches, plums, pears, raspberries</li> <li> <b>Nuts</b> including almonds, cashew nuts, kola nuts</li> <li> <b>Avocados</b></li> </ul> <p><small>Also includes: cucumber, buckwheat, nutmeg, anise, fennel, coriander</small></p>
<p><b>Essential</b> Yield reduction greater than 90% without pollinators</p>	<ul style="list-style-type: none"> <li> <b>Fruits</b> including kiwi, melons, pumpkins, watermelons</li> <li> <b>Cocoa beans</b></li> <li> <b>Brazil nuts</b></li> </ul> <p><small>Also includes: vanilla, quinces</small></p>

Sources: Marcelo Aizen et al. (2019) and Alexandra-Maria Klein et al. (2006). Icons sourced from Noun Project. OurWorldInData.org – Research and data to make progress against the world’s largest problems. Licensed under CC-BY by the author Hannah Ritchie.

**Table 1:** Foods that are dependent on pollinator insects (Ritchie, 2021)

# Market

In the United States, there are over 100 crops and one third of all crops depend on insect pollination. Managed honey bee colonies add at least \$18 billion a year through increased yields and higher quality harvests [2]. The crops include Almonds, which BeeCause will focus on in early stages, as well as apples, melons, cranberries, pumpkins, squash and broccoli.

Agriculture is a significant sector in California's economy, producing nearly \$50 billion in revenue (in 2018), and in 2021, the Almond crop alone generated over \$5 billion USD of value from over 1.3 million acres.

The natural population of pollinators, and specifically bees is not sufficient for the crops needing pollination. This is a combination of loss of natural bee populations due to climate change, pesticides, habitat loss and bee pathogens, as well as increased crops requiring pollination. Just in California, the acreage in use for Almond crops has tripled in the last 25 years from 418,000 acres in 1995 to 1.32 million acres in 2021 [3].

To simply maintain yields, pollination levels must be maintained, and this requires bees to be transported to areas during the pollination season. There is a deficit of 2.8 million hives between what is required in California for Almond pollination and what is available. To satisfy this need, farmers and beekeepers need to be able to find each other and close transactions.

Longer term, the beekeeping industry has not had a technological revolution since the early 1900's. There are interesting developments just on the edge of research to commercialisation.

## Present State

The current beekeeping and beehive rental market is fragmented and nascent with the beekeeping and farming industries both relying heavily on word of mouth and existing community. There are some rudimentary solution offerings available presently, which were identified as:

- Human Relationship. Fragmented and not scalable.
- Simple directory listing for beekeepers and farmers. Risks are not covered.
- Brokerage services. Very human intensive and not scalable.

Beekeeping has known limitations in scaling vertically. A single farmer would often require more than one beekeeper to provide hives for pollination on their farm. Present solutions rely on people in the middle to connect farmers and beekeepers, and this cannot scale to meet the required number of connections. Moreover, contracts are often handshake agreements which leaves the beekeepers at significant risk of not being paid fully or of losing their bee colonies through poor care while at the farm with little recourse.

From our market survey, we concluded that there is presently no single, scalable solution provider who covers all aspects of what enables beekeepers and farmers to find each other, agree a contract and complete the transaction without other humans in the loop. This inturn leads to poor pollination and reduced productivity. **BeeCause** will be the first to offer an integrated self-service network development and eCommerce on a software platform.

## Challenges in detail

Pollination is a critical part of the food production chain. However, there are not enough naturally occurring pollinators to service all crops. Nectarivorous bee population is declining in the wild due to a number of environmental factors. This has led to an industry of beekeepers who rent their hives to farmers during the pollinating season.

However, there are not enough beehives in the USA to service the California Almond industry. To pollinate the California almond crop:

- 3.24 million hives are needed
- 2.5 million are available in the USA
- 400,000 are located in CA
- 2.1M hives could be transported to CA from other states
- Leaving a deficit of 740,000 hives that are not available in the USA

The deficit of bee hives is likely leading to reduced yields due to lack of pollination. The lack of available hives is exacerbated because farmers and beekeepers do not have an efficient way to find each other, agree a contract and have the pollination service (beehive rental) provided as agreed. This means that utilization of available hives in the USA is less than 100%, making crop pollination and subsequently yields lower than could be achieved.

The beekeepers are typically the smaller entity to the arrangement and are at a significant disadvantage because there is no standardized pricing, agreeing a legal contract is expensive as it is not the norm. They also have the risk of losing bees, which are a capital asset in their business, due to poor care. Reducing some of these risks, and making high utilization of beehive rental easier will make beekeeping a more attractive industry to new entrants to the market.

# Our solution - BeeCause

The core solution is a web-based software platform that enables farmers and beekeepers to create their profiles and find the other party needed to establish a service contract; i.e. renting bee hives.

This will bridge the gap between farmers and beekeepers to get bees where they are needed when they are needed. There will be a higher utilization of the scarce resource of bee colonies and increased crop yield from better pollination. Moreover, by making the connection between Beekeepers and Farmers simple, transparent and risk-free, we can potentially attract more young people into the Beekeeping business, thereby fulfilling the growing demand for Bees.

## Roadmap

We have envisaged a phased approach for our product and have built the plan for the next 4 years. We will enter the market as an easy-to-use web platform which can take advantage of the gaps present in the current market state. After the initial pitch and meeting of initial revenue goals, we will work on building the ecosystem for nurturing the product to more than a connection platform. This will include expanding into other markets, additional services and modernization of the Beekeeping landscape. Roadmap for next 4 years is discussed in detail in the next few subsections. Please refer to Figure 1 for a high level overview of goals in each phase.

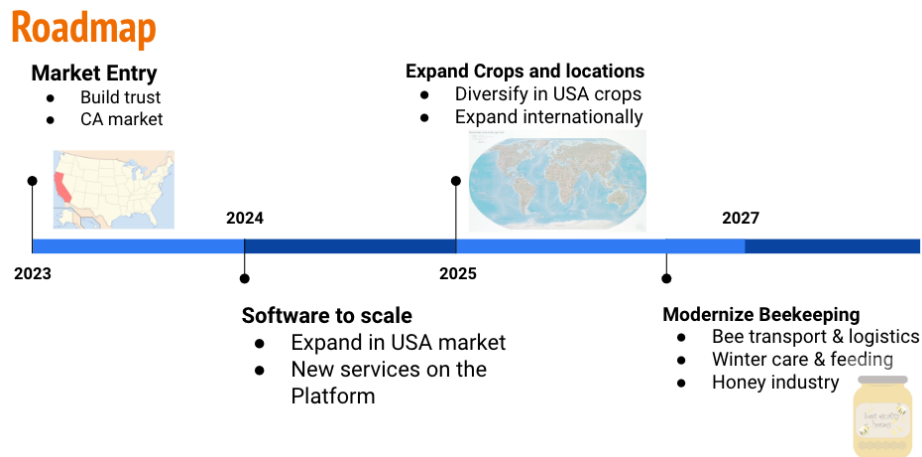


Figure 1: Roadmap for next 4 years



## Phase 1: Market Entry

In the first phase, we will establish BeeCause as a web platform for networking between Farmers and Beekeepers which also will be the eCommerce platform for beehive rental and related services. Services layered on top of this provide value to both parties and revenue for the BeeCause business. Our primary focus in this phase will be to achieve the following:

- **Focus on the California Almond market.** By narrowing down the initial focus area, we will learn deeply about the industry, build trust and establish our initial customer base.
- **A scalable and user-friendly web application** where Farmers and Beekeepers can create their profiles and connect each other. Figure 2 will provide a high level overview of the workflow in the initial phase.
- **Standardized contracts to provide legal certainty.** A written record of the arrangement at a lower cost than individual agreements, available through the web platform. The beekeepers are the party with the most risk in the arrangement and are often a small family business without access to legal advice. These contracts will provide some protection and legal recourse for under payment for their services (hive rental) or damage to their assets (the bees' health).
- **A Rating System** where both Beekeepers and Farmers can rate one another based on a number of metrics like, the quality of pollination service, safety of bees and ease of dealings. This will be similar to the Uber model where the rider and driver can rate each other.
- **An online payment system with the option of an escrow service.** Not receiving payment is a major risk to beekeepers' business today. A third party escrow service integrated with the BeeCause platform will provide the payment guarantee. escrow can be an optional service and will be available at an affordable charge.
- **Private Consultation Service** will be available to the Farmers. This will be considered as business development cost in the early stage and later will be offered as an add-on service. This human engagement will help BeeCause build the personal relationship in the initial phase. Project managers with years of experience in the relevant industry can work with larger farmers to find the needed beehives from many beekeepers to service their acreage.

The primary workflow after farmers and beekeepers have created their profiles is expected to be initiated by farmers searching for beekeepers who can service their crop pollination needs.

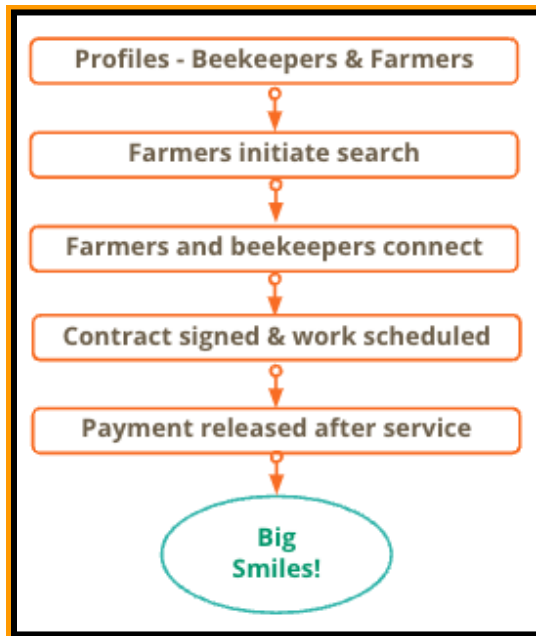


Figure 2: High level workflow

The workflow for a beekeeper to search for farmers is equally supported. This would enable a beekeeper to find a sequence of farmers with different crops with different pollination times to arrange multiple rentals in a year.

Figure 3 displays some of the screen mock-ups for the next stage of user research and market testing. It is not a sophisticated market so ease of use and low barrier to entry is critical.



Figure 3: Screen mock-ups

**BeeCause** web platform is the core solution and this is where the focus is for the first year. The measures of success in this phase are:

1. Sufficient connections with large Farmers based in California and Beekeepers from CA and nearby states to capture 10% of total beehive rental transactions in the California Almond pollination industry on the BeeCause platform. This is calculated to generate \$1.75M revenue, sufficient enough to move to the next phase, in the first year.
2. Adoption across the Beekeeping community measured by the number of beekeepers who have active profiles on BeeCause, even if not completing transactions. We are targeting at least 500 Beekeeper accounts in the first year.

## Phase 2: Software to scale, Data to inform

This period is all about taking what worked in Phase 1, doing more of it, and doing it more efficiently. We will stick to only the Almond industry but will expand to other locations in the United States. Focus area for this phase will be as follows:

### BeeCause Platform Maturity

The learnings from the previous phase will be applied in this phase.

- Refine the contract templates, fix the flaws in digital signing.
- Refine integrated escrow service, consider more third party services with seamless integration and lower costs.
- Purchase order (PO) and Invoicing for larger operations
- Enhancing the transactions completed information with summary reports of services used and costs.
- Improve the rating system to produce more granular recommendations
- Additional service providers on the platform like Transport and Food providers

These additional features and services will increase the benefits of being on our platform and expand the eCommerce transactions. The above goals are expected to increase the Daily Active Users (DAU) which will be a major measure for the success of our business.

### Data Driven Business

The data captured about transactions done through the BeeCause platform provides valuable base data which can be enhanced from other sources.

Data that the system will have available from the adoption include:

- Farmers
  - Acreage needing pollination
  - Geo-location of the farm
  - Yield from past years
- Beekeepers
  - Hives available for rental
  - Location of the hives

- Type of Bees being used. 7 popular types of Bees used in the USA are Western, Italian, Grey/Carniolan, Himalayan, German, Gibraltar, Caucasian
- Age of colony

As transactions are established, we will have visibility of:

- Time and day of the year pollination service was done for each farm
- Bee density desired (number of hives requested per acre)
- Bee density achieved (what the farmer was able to rent)
- Through surveys with farmers we will collect data on crop yield to inform the optimal bee density.
- The types of bees used by a given farmer, leading to x% of change in yield.

Data that is available outside our platform that we will collect and use includes

- Regional seasons: this is collected by different organizations and we will collate it into one system to inform pollination schedules across the USA. As adoption of BeeCause grows we will move from a consumer of this data to a provider to inform other environment and agricultural improvement programs.
- Farmer survey data: We will survey the type of crops, acreage, geographic regions and crop yields. We will demonstrate the benefits of providing this data into larger pools for analysis and in return provide reports and recommendations. Further market research will inform what is valuable to farmers in return for sharing this data.
- Beekeeper survey data: Similar to the farmer surveys, we will survey beekeepers to collect data such as the type of bee/s they are sending, and number of workers in the hive. Further market research will inform what is valuable to beekeepers in return for sharing this data.

Analysis of this data will enable deeper understanding of what factors influence crop yield, and in turn optimize both beekeeping and farming practices.

We could potentially invest on the following data-driven features.

- The ideal time of the year for pollination service for a given geolocation
- Type/s of bees proven good for a particular geography or temperature
- Effect of age of a Queen on efficient pollination
- Effect of weather on efficient pollination

## Phase 3: Expand Crops and locations

In this phase, we will be expanding the business to new markets. This includes both crop diversity in the USA market and expansion to new international markets.

### Crop Diversity

Expanding to new crops in the USA will enable beekeepers to have rental income from multiple locations in a calendar year, by pollinating different crops in different seasons.

We expect this to:

- Increase the profitability of their business
- Increase the revenue generated on BeeCause
- Increase the attractiveness of the beekeeping industry to new entrants

### International Markets

Countries like India, Europe and Australia have large agricultural industries that are dependent on pollination. At this stage there is a much smaller need for facilitated pollination - the moving of beehives in during the flowering period - but as the acreage under crop increases the natural bee population will not be sufficient. The launch to the international markets will be backed up by the learnings from Phase 1 and Phase 2 in the USA market.

The Australian government through the Rural Industries Research & Development Corporation (RIRDC) has a research, development and extension (RD&E) program. This is a five year program that is designed to foster a productive, sustainable and more profitable Australian beekeeping industry and secure the pollination of Australia's horticultural and agricultural crops [4]. BeeCause will contribute to achieving the goals identified in this strategy. The data collection started in Phase 2 also contributes to the goals identified in the strategy and will create opportunities for partnerships in Australian agriculture.

### More intense Data Driven Business

The following measurements have been identified as useful, but require investment in technology and coordination with beekeepers. After establishing ourselves in the market and proving the value of data we will work with beekeepers and farmers to measure:

- Bee health: Measurements of bee health require inputs from outside the platform; this will be dependent on costs and accessibility of equipment.

- Organic certification: by tracking where bees are used and incorporating information on whether local areas are organically farmed, we can determine which hives are producing organic honey.
- Accurate GPS locations: of hives on property to understand timing and location of moves to suggest optimizations.
- Optimize usage and nutrition: When the bees are at a location they gain the maximum nutrition and can be used for another pollination service for a more nutritious crop or provide supplementary food.

## Phase 4 - Modernize beekeeping:

Much of the technology used in beekeeping today dates from the early 1900's. There is significant opportunity to modernize this and several research areas that are entering commercial evaluation. In three years time, we predict that there will be technology options available for BeeCause to expand from a networking and eCommerce platform to a logistics and scaled beekeeping operation.

The new business areas are:

- **Bee transportation** by managing the relocation of bees to different crops and wintering locations the transport is more efficient and more crops can be pollinated by a single colony of bees.
- **Bee wintering** when crops are not available for pollination the bees require care and feeding. The bee transportation business reduces the time this is required. By using the latest technology and scaling the number of colonies managed, the health of the bees will increase and the cost of wintering will reduce.
- **Honey production** there is demand for honey and by reducing the labor required to harvest honey it can be a significant source of income.
- **Bee conservation** by Acquiring land and building safe habitats. This could be aligned with bee wintering or a separate conservation charity business with a percentage of profits donated from the original BeeCause platform.

### More Data Driven Business

With the new business of modernizing beekeeping the equipment will have sensors to measure aspects we have not even considered at this stage. Research and planning for Phase 4 will incorporate this. Opportunities include determining which food and supplements make a measurable difference at scale and safest methods of bee transport.



## Go-to Market Strategy:

Our strategy has three streams, connecting to farmers, participation at community events and social media activities.

### Connect with Large farmers

Building relationships with large and influential farming leaders so they understand the benefits of the platform. Through our business development activities our team will facilitate the contracts they need with the beekeepers to ensure both parties success in the first year. Small scale farmers will be following the large business. To meet the initial goal of capturing transactions for 10% of beehive rental to service Almond crops in California, we should onboard 132,000 acres of farms.

### Conferences and Ag Expos

The American Beekeeping Federation [6] advocates for the beekeeping industry on issues affecting the interests and the economic viability of the various sectors of the industry. They run an annual Conference & Tradeshow with special interest group sessions in parallel. We will be an exhibitor and sponsor at this event.

The California State Beekeepers Association [8] runs a convention each year and has localized affiliated clubs. We will sponsor, exhibit and attend events as appropriate to build strong engagement with the Californian beekeepers in the first year of operation.

As we expand through the USA, we will sponsor and exhibit at events organized by state based associations, such as the Winter Meeting held by the Colorado Beekeepers Association [7].

### Social Media

Some Farmers and Beekeepers are already active in social media including Facebook and Instagram. Running BeeCause campaigns on popular social media websites and establishing ourselves as a successful venture there can be another strategy to build business. Social Media has proven good for building initial customer base for many startup companies.

# Financials

## Business Model

The core business model is 2.5% commission on every beehive rental transaction executed on the BeeCause platform. This will underpin the business growth until the step change to Beekeeping Modernization in Phase 4.

As the business expands to new services, the commission on those services will be determined based on the value BeeCause provides. These are expected to provide small, incremental growth relative to the beehive rental revenue.

There will also be services with one-time fees such as access to analytical reports and consultation services to coordinate multiple beekeepers.

Private consultation will be an add-on service offered to the Farmers, which is expected to contribute to the revenue. This will be initially provided as a free service, as a Business Development plan. However, once we have successfully met the Phase 1 goal, this will evolve to a paid service.

Some of the services that will be integrated, such as escrow, have fees based on the value of the transaction. These will be made visible and passed through unchanged to the farmers and beekeepers. Additional revenue for BeeCause will be generated because these services make it easier to complete transactions so more people come to our platform and more base transactions are completed.

## Revenue

Revenue calculations for the first three years are shown in the following table.

Revenue	Year 1	Year 2	Year 3
<b>Bee Hives</b>			
Acreage used for crops - total target market	810,000	810,000	1,620,000
Acreage Locations	CA, Almonds	CA All Crops	USA All Crops, Entry to other markets
Hives per acre	4	4	
% of the market we win - hive rental. Left the % of market the same to balance expanding into new markets	10%	20%	30%
What that % means in acres BeeCause is servicing with hives	81,000	162,000	486,000
Growth wrt previous year			
Average price per hive	\$200	\$200	\$200
Number of hives	324,000		
Value of hives rented through platform	\$64,800,000	\$129,600,000	\$388,800,000
% taken for base rental	2%	2%	2%
<b>Revenue from hives</b>	<b>\$1,620,000</b>	<b>\$3,240,000</b>	<b>\$9,720,000</b>
Of transactions on our platform, percent that use an additional priced service	10%	15%	20%
% taken for additional services	3%	3%	3%
<b>Revenue from additional transactions</b>	<b>\$194,400</b>	<b>\$583,200</b>	<b>\$2,332,800</b>
<b>Total Revenue</b>	<b>\$1,814,400</b>	<b>\$3,823,200</b>	<b>\$12,052,800</b>

## Costs

The following table shows estimates for the costs of running the business in the first three years. Costs for Phase 2 have not been developed. It is a step change in the business and the technology to support it is expected to mature significantly in the next three years.

Based on the revenue projections in the previous section, the business will have a small loss in the first year of \$235,000 and in the second year be cash flow positive by over \$1.3m dollars.

FTE: Full Time Equivalent

Cost Category	Year 1	Year 2	Year 3
G&A (general & administrative)	\$200,000	\$240,000	\$288,000
AWS Hosting - expect significant growth in year 3	\$300,000	\$360,000	\$792,000
Sales & Marketing	\$100,000	\$150,000	\$225,000
Team travel & meetup	\$200,000	\$200,000	\$200,000
<b>Startup team personnel</b>			
CEO	\$150,000	\$150,000	\$150,000
CTO	\$130,000	\$130,000	\$130,000
Financial advice - through retaining contract	\$150,000	\$130,000	\$130,000
Legal advice through retaining contract	\$150,000	\$130,000	\$130,000
Operations staff Two in the first year growing to four in the third year	\$120,000	\$180,000	\$240,000
Engineers - build and support app Two FTE in the first year growing to three in the third year	\$280,000	\$280,000	\$420,000
Sales and business development (Three FTE)	\$270,000	\$270,000	\$270,000
<b>Total Fixed Costs</b>	<b>\$2,050,000</b>	<b>\$2,220,000</b>	<b>\$2,975,000</b>

- Escrow services - this will incur additional cost on the overall rental transaction. It is set by the third party service integrated to BeeCause and will be passed on to the beekeepers and farmers.

# Investment

We are looking for \$10 million dollars initial investment so we can accelerate the business and get to phase 4, Modernize Beekeeping before the challengers in the marketplace.

The business could be grown slowly with limited initial investment and still become a profitable business. However it is unlikely the full opportunity of global expansion will be realized and we will likely miss the first mover advantage on beekeeping modernization.

Table 1:

	Year 1	Year 2	Year 3
<b>Total Revenue</b>	\$1,814,400	\$3,823,200	\$12,052,800
<b>Total Fixed Costs</b>	<b>\$2,050,000</b>	<b>\$2,220,000</b>	<b>\$2,975,000</b>
<b>Net Profits</b>			
<b>Gross Profit – Fixed Costs</b>	-\$235,600	\$1,603,200	\$9,077,800
<b>Accumulated Profit</b>	<b>-\$235,600</b>	<b>\$1,367,600</b>	<b>\$10,445,400</b>
	Investment critical for rapid growth	Begin repaying investment	Investment fully repaid and business is profitable  Second round of funding sought for phase 3, Beekeeping Modernization

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[https://www.nass.usda.gov/Publications/Todays\\_Reports/reports/cstpol17.pdf](https://www.nass.usda.gov/Publications/Todays_Reports/reports/cstpol17.pdf)
6. American Beekeeping Federation: <https://www.abfnet.org>
7. Colorado Beekeepers Association: <https://coloradobeekeepers.org>
8. California State Beekeepers Association:  
<https://www.californiastatebeekeepers.com>
9. <https://www.usda.gov/sites/default/files/documents/annual-pollinator-report-2022.pdf>