Pathways to Blue Oceans: The case of three agritech companies

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ABSTRACT

Blue Ocean Strategy has become the most innovative approach to creating and sustaining competitiveness in organizations. Over the past several years, many organizations across numerous industries have adopted it as a way of ensuring and protecting their performance. The AgriTech sector is an emerging technology sector using the Internet of Things (IoT), the latest innovations in coatings as well as data and relationships to accelerate the seizure of opportunities in the food and agricultural industries. Whether focusing on generating easily accessible information to make data driven decisions in an orchard, or optimizing the value downstream by expanding the use of coatings to reduce food waste or using data and past relationships to attribute value to future sales, innovative startups in the space are playing a role in further refining applications of technology to add value to different stakeholders across the supply chain.

The purpose of this research was to evaluate a selected number of these emerging Agritech products within the context of their ability to help their users create blue ocean strategies that shift the competitive advantage landscape in their industries. The selected technologies spanned use in field, moisture measurement, and financing. These solutions allow the customers to reduce their waste, maintain the quality of their production, optimize productivity, and increase their overall profitability. In providing these solutions, these companies separate themselves from their competitors. But they do more. They also alter the nature of competition in their industries because they, through their Blue Ocean Strategy actions, force their peers to up their game to serve their own customers or else risk losing them. The three companies reviewed have each been around for at least a decade,

and in that time some competitors have sprung up in the space, offering similar solutions in the past few years. However, one of the strongest advantages of being first to market for your product or service is that you can continue deploying Blue Ocean strategies to continue molding the market offering and in combination with relationship building efforts, these evolutions can result in a dynamic, sustainable business that continuously adds value to the supply chain. They also alter the nature of competition in their industries because they, through their Blue Ocean Strategy actions, force their peers to up their game to serve their customers or else risk losing them.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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CHAPTER I: INTRODUCTION

1.1: Background

The last three decades have seen an unprecedented growth in the application of modern information technologies available to virtually every sector of the economy. Although their applications to address agricultural problems may not make headlines like the latest electric car or phone, strides and innovations in the space bring greater efficiencies and improvements to the way we grow, transport and consume fresh produce. As new technologies have emerged with unique nomenclature – Fintech, Insurtech, Medtech, etc. – so has Agritech emerged to provide technological solutions directed specifically to agriculture. Reports show that more than 120 Agritech startups sprung up in the last few years, with nearly $1 billion raised in 2023 alone (Seedtable, 2024).

In the Agritech space, innovative technologies continue to develop and enable users to make data-driven decisions and optimize resources in every step of the process in the agricultural supply chain, from pre-harvest all the way through to delivery at destination. As the 20th century ushered in an era where larger-scale, commercial tree fruit orchards began to appear in the United States, the tree fruit industry became increasingly specialized and by the turn of the century, many focused on particular cultivars. This also brought a standardization in growing practices, including spacing, root stock selections, and pruning practices. In fact, their choice of transportation – rail, road, sea, and air – to facilitate efficiency of delivery also became standardized (National Park Service, 2022). Tractors, sprayers, wind machines, pickers, and other innovations improved the production process in the orchard as sorting and packing machines enhanced efficiencies and quality in the packhouse. The development of refrigerated trucks and ocean containers opened up new

and distant markets (Maersk, 2019), as well as expanding seasonality, leading to the possibility of increasing supply to address the new demand.

Progressing into the 21st century, further technological innovation and optimization continued to build upon technological feats achieved in the 20th century. This facilitated greater productivity on farms and in orchards, improved quality while maintaining it from harvest all the way through to the destination market. Despite these advances, some of the same challenges from the industry's history continue to pose a threat to fruit production: climate-related issues, hand-labor scarcity, post-harvest loss, as supply chain issues. Agritech companies are bringing solutions harnessing applicable components of broader technologies emerging in the economy to help the fruit industry overcome some of these age-old challenges.

An example of a weather-related challenge that comes every year during spring is frost. It is a major risk to fruits throughout growing stages – from flowering through the fruit set. It is not unusual for a sudden change in the weather to cause significant loss of production. Solutions to the problem over the years have included the installation of large fans capable of creating inversion layers in orchards (Ribeiro, De Melo-Abreu, & Snyder, 2006). Historically, these large fans have had to be managed visually through monitoring. On a very cold night in 2012, this researcher, then a technology sales consultant, drove around the California citrus orchard at which he worked with an orchard manager in the middle of the night for several hours inspecting wind machines, verifying that the machines were operational, that the temperatures were correct and that they were fulfilling their intended purpose.

Today, new technologies now allow for more efficient and completely remote monitoring (Beyá-Marshall, Herrera, Santibáñez, & Fichet, 2019). Automated systems with cellular connections and smartphone interfaces include diagnostic tools with machines remotely reporting status updates so that managers, owners or other stakeholders can efficiently make decisions for multiple sites, allocating resources appropriately (Orchard Rite, 2022). Similarly, drone or camera-based tools compatible with existing platforms like smartphones allow growers to better efficiently observe their orchards during the growing season, even assisting in harvest (Mandel, 2023). These emerging technologies also help quantify harvest size and onward inventory management to successfully fulfill sales bids (Hectre, 2023). They also lead to fewer repacks, reduce pack line downtime, increase productivity, and produce significant time and cost savings. All of these activities enhance productivity.

Post-harvest has been one of the most challenging segments in the fruit business. Recent developments in the Agritech space are contributing innovative solutions in postharvest handling (Valenzuela, 2023). Innovations in storage and postharvest management practices, which have become critical in closing the production cycle, assure products meet and retain the quality characteristics desired all the way to the supermarket and subsequent final consumer (Mditshwa, Magwaza, Tesfay, & Mbili, 2017). In the case of the storage facility and packhouse for apples, for example, technology applications range from dynamic controlled atmosphere long term storage sometimes beyond 12 months (Thewes, et al., 2021), to the latest formulations in postharvest chemicals via coating or wax applications to extend shelf life (Devi, Kalita, Mukherjee, & Kumar, 2022). Delays in shipping times due to external uncontrollable or other unforeseen difficulties, such as a

pandemic, war, infrastructure limitations, have always posed a threat to perishable goods. Logically, stakeholders across the supply chain consistently review best handling practices to extend shelf life in lieu of these challenges, especially when sellers have promised delivering a perishable product in a particular state or grade at a particular time to a particular destination for an agreed upon price.

In addition to possible delays or temperature breaks in shipping, limited visibility and response time restricts stakeholders' ability to respond after the fruit goes into the final case that is then put on a pallet and shipped, as fruit can travel on a truck, airplane, shipping vessel or a combination of those anywhere from a few hours to 60 days depending on the commodity and destination. The perishable nature of fruit traveling by ocean, for example, limits the actionable nature of real time visibility. Growers and shippers take utmost care to protect the fruit to avoid facing the costly and near impossibility of rerouting the shipment and the likelihood of facing a loss on production costs, if it doesn't meet the expectations regardless of the externality is attributed to the activities within their control, to others in the supply chain or to aforementioned unforeseen externalities.

In the same vein, participants in the supply chain like growers and shippers must hedge operational costs and prepare diligently for the calendar year. Much like the chicken and the egg analogy, fruit growers rely on sales from previous years' fruit in large part to help with operational costs for the upcoming season. This can be complemented with financial loans from traditional banks, as well as various financial instruments. Financial solvency in the fruit growing business is delicate, requiring continuous monitoring, management in expenditures and verifying returns. In the case of seasonal fruit, both large and small growers must track costs of fertilizers, fungicides, irrigation, hand labor,

calculating a breakeven sales price that would cover all preharvest, postharvest, and shipping activities. In table grapes, for example, a grower may determine that a breakeven price is 15 USD for an 8.2kg case of fruit. The sales team must work to ensure that the sale price for the cases of fruit over the course of the season equal or surpass the 15 USD. Timelines on generating the returns also take time. When shipping from Mexico to the USA, for example, shippers will get an invoice paid in a week or perhaps two. When shipping from Latin America to Asia or the Middle East, in contrast, shipping times alone can range from 35 to almost 60 days, meaning that it could be over two months before having an invoice paid. If the perceived fruit quality on arrival is below the negotiated quality, adjustments or rejections can occur. Similarly, if an importer tries to take advantage of a shipper by qualifying the fruit as lower quality than it actually is, they can also attempt to negotiate in poor faith to the detriment of the shipper. The growers must keep all this in mind to maintain the 15 USD break-even price, knowing that at times, they may receive 8 USD in the worst of times or 50 USD when the market goes well.

Historically, relationships drive this industry, meaning that shippers and importers build experiences together, trusting that the quality negotiated is the quality shipped, and trusting that when an issue arises in the final sale of the fruit or the arrival at the port, it is genuine. This allows for building long-term, sustainable relationships that can weather difficult seasons and yield immense profitability in good seasons. The nature of these relationships also can become natural barriers to entry for any new player. While larger companies in the space have become vertically integrated, many are not. The risk from the entire exercise can lead to very difficult scenarios with companies facing restructuring, exiting a commodity, or leaving the sector entirely (Whittle, 2017). The cash flow

expected from a seasonal harvest and sale, therefore, relies on preharvest, postharvest, and arrivals handling, commercial relationships. In every one of these activities, successfully managing the execution requires utmost attention to detail and prudent financial stewardship with cash flow, to maximize the return on the investment. Examples of decisions and tradeoffs closely linked to cash flow that growers consider during the preharvest can include: deciding how much to hold back from buying better fertilizers or fungicides, how much new production to bring online or simply, how much yield to generate from each hectare in production, cognizant of the possible financial tradeoff for volume versus quality.

Innovations in this space have branched beyond traditional financial loan instruments, which require land or other capital expenditure as collateral, to using futures on the sale of the fruit as a guarantee. Furthermore, innovators in this space are addressing the challenges with assuring a good final return amount for the grower by developing a verified network approach, opening up a traditional, closely-guarded relationship-driven market.

Whether in the orchard, the packhouse or in transit or arrival, Agritech companies have grown in the last decades to address today's challenges, providing value to participants across the supply chain by implementing useful tools, while at the same time, strategically positioning themselves to become an integral part of an industry standard, as had been done in the 20th century with refrigeration and transportation networks. This thesis will explore the strategy behind some of these Agritech innovations in field measurement instruments, post-harvest loss management and cash flow optimization.

1.1 Research Question

Increasing competition across the sector continuously applies pressure on all stakeholders' margins at every node in the supply chain. Therefore, exploiting the maximum efficiency from every activity becomes critical to the sustainability of profits and performance. As indicated above, emerging Agritech solutions continue to adapt to address some of these challenges. For growers, managing soil nutrients and moisture, disease pressure and temperature changes become increasingly critical as inputs such as fertilizer, fungicides, irrigation, frost prevention and labor costs increase. Additionally, the search for higher food safety and environmental solutions puts pressure on producers to use chemicals more effectively. Growers who show they meet these practices or standards may be compensated or otherwise penalized or simply excluded from the ability to bid for contracts. Furthermore, upon shipping, exporters have little to no control of handling of the container and rely on shipping lines and destination ports as well as importers to adequately continue the correct handling and pay the agreed amounts in a timely fashion. Issues could arise with quality upon arrival. For example, if apples arrive soft or with decay, penalization processes include price adjustments or rejections for the exporter or importer or both, possibly causing an insurance claim, depending on shipping terms. One significant culprit that can cause adjustments or rejections is a break in the cold chain or a delay in shipping times. By addressing these challenges, solution providers help optimize results for growers and their supply chains.

Given these market opportunities, the research question for this thesis is this: *Do the emerging Agritech solutions offer Blue Ocean outcomes for those who adopt them and in doing so, alter the nature of the market?* This question is important for several reasons. Numerous technologies come to market, each presenting itself as the next big breakthrough

in innovation. However, enhancing margins and industry profitability will define the success for the incumbents as well as attract new entrants in this category.

The thesis does not cover the plethora of currently available solutions existing from orchard through to supermarket. This thesis addresses specific areas revolving around fruit production in preharvest and postharvest handling and associated operational cash flow constraints. Its focus is around three areas of business-to-business (B2B) service providers stems from the researcher's personal learning throughout his career in the Agritech space. The first case starts in the orchard, where the fruit grows and focuses on the emerging area of field measurement instruments, which is becoming increasingly important because of input use efficiencies, as well as food safety concerns. The second case follows the fruit in postharvest handling quality assurance, helping improve shelf life, which is important for managing the increasingly important issue of food waste, financial adjustments, or losses as well as shipping delays. The third case reviews financial instruments that allow for cash-flow efficiencies and reduce risk from shipping perishable goods to destination markets around the world.

1.2 Research Objectives

The overall objective of this thesis is to illustrate the effect of emerging technologies on the development of Blue Ocean strategies using the agri-food sector as a testbed. Specifically, the research seeks to explore the contribution of three companies' value-added solutions in the agri-food sector to the development of Blue Ocean strategies. The specific objectives are as follows:

1. Provide an overview of the emerging technologies and instruments along the agri-food supply chain with the potential of altering competition in their market nodes.

2. Discuss the case companies and their business models and how they differ from the status quo of their industries.
3. Provide a summary of the characteristics of Blue Ocean Strategy and its advantages and challenges to alternative strategy initiatives.
4. Provide an analysis of how the case companies create Blue Ocean Strategy in their markets.
5. Show how the case companies alter competition in their markets through their Blue Ocean Strategy initiatives.

1.3 Why is this research important?

The global population is currently projected to reach 9 billion people in less than 15 years (Engelman, 2016). As such, policies regarding food security have become more important. Fruits and vegetables are important contributors to the health of this emerging population. Fruit growers' productivity in the face of dwindling production resources and increasing operational costs is a critical factor in sustaining the health and wellbeing of this population. This means making the best use of surface areas by optimizing inputs and minimizing losses in the preharvest and postharvest. In the United States, the USDA Economic Research Service estimates that between 31% of food goes to waste at retail and consumer level (USDA/ERS, n.d.). For fruit growers in relation to food security, having the ability to grow, harvest, pack and ship fruit in spite of operational challenges, cash-flow crunches or externalities merits further study.

Furthermore, forfeiting the price of a piece of fruit when a consumer lets it spoil on the counter or when it is ripe beyond sellable state at a store only captures part of the picture. Wasted food also represents the time and energy invested into the cultivation, harvest, postharvest and transit of the fruit to the destination, passing by multiple

stakeholders, as well as the opportunity cost of forgoing allocation of that piece of fruit to another consumer who would have enjoyed it.

From an orchard perspective, reduced pre-harvest optimization can contribute to inferior quality fruit, which can result in a lower market price, in addition to possibly having a shorter shelf life. In the packhouse and post handling, poor management can also mean reduced returns for a shipper because it can negatively deteriorate the quality of the fruit. Finally, with regards to transportation, faulty shipping or handling practices or issues with receivers after the packhouse harms fruit quality, creates a negative reputation for the brand or region and decreases its marketability. A difficult growing season or externality such as a pandemic can lead to a negative perception in a destination market and fruit could receive lower sales price (Komorek, 2021), meaning lower returns for shippers. While the extent of these losses has not been the focus of many studies, it is important to contribute to the discussion by highlighting some innovations in use so that stakeholders across the supply chain from growers and shippers to importers, retailers and consumers ***can benefit***. Therefore, this research makes two major contributions:

First, it highlights the importance of optimization throughout the supply chain to address food waste and food security strategies:

1. Careful management including pre-harvest, postharvest and overall financial practices can contribute to significant gains. Actionable real-time data can help yield high quality fruit during development (that will likely have a longer shelf life than fruit with lower pre-harvest management practices). Postharvest shelf life technologies will help maintain the quality harvested to reduce food waste.

Financial solvency covering upfront operational costs prior to the sale of the fruit can make for a more robust and stable operation.

2. Second, it showcases some of the companies that are already afoot proposing innovations in this space. It presents these companies through the Blue Ocean Strategy lens to illustrate the importance of enhancing competitiveness while creating value innovation. We argue that a focused attention on value innovation as the pathway to competitiveness would be beneficial to the whole sector by expanding the total industry revenue. Whether it means reaching new markets, extending seasonality for existing markets or improving the overall supply chain performance and experience, the value created when optimizing operations can benefit the industry. This contrasts with red ocean strategies' zero-sum outcomes since competing firms only "steal" market share and revenues from each other without expanding the market.

CHAPTER II: LITERATURE REVIEW

In this chapter, we present an overview of the literature on the whole arena of measuring instruments, the postharvest technologies in the horticulture industry, the financial instruments available to growers, and the concept of Blue Ocean Strategy (BOS). In the first two sections, we focus on the challenges of inadequate and timely information and their effect on production as well as the risks to global food supply from postharvest losses. We also address the technologies that are being developed to ameliorate these challenges and seize the opportunities. In our review of BOS, we define the concept and describe its principal characteristics. We discuss the tools that support the assessment of conditions favorable to BOS and the processes that may be used to develop BOS in different industries. We focus on the core contribution of BOS to sustain competitive advantages, which is the concept of value innovation. We conclude the chapter with a synthesis of how the situation in the world food environment and the BOS approach offer a significant foundation for overcoming the challenges that confront the management of the increasing population of humanity going forward.

2.1 Field Measurement Instruments and Food Production

For as long as humans have cultivated plants outdoors for food, we have relied on weather conditions to provide a hospitable, favorable environment for fruits and vegetables to grow. Certain areas, for example, due to favorable environments can foster the cultivation of specific types of tree fruit. Immediately north of Grand Rapids, for example, is an area known as “the Ridge”, where the elevation helps soften the winter climate and helps foster a better climate suitable for growing apples. The same effect occurs with microclimate conditions felt along the Niagara Fruit Belt in Ontario, Canada, where the Great Lakes provide a buffer zone that allow for grapes, peaches and cherries to grow,

whereas south of them in upstate New York, where one would presume would have warmer weather due to the latitude, have winters that are too cold to survive. These hospitable regions, such as the Ridge, can experience frosts through Memorial Day, the severity of the frost becomes relevant as the trees exit dormancy and begin bud development. A frost event can cause a significant reduction in fruit production, for example. Growers historically have used thermometers to monitor temperatures and since the 1950s (Brown, 2013), many growers have used fans in an attempt to create an inversion layer, whereby warmer air comes closer to the ground and stays a few degrees higher than otherwise undisturbed air, and saves crops from frost damage. As previously referenced, until the last decade, much of this monitoring activity had been in person, requiring sleepless nights during the spring. Failure to control frost damage can significantly reduce fruit production.

Similarly, monitoring for diseases in apples based on Degree Day forecasting models, for scab, fire blight or codling moth to schedule preventative spray events requires attention to on-going temperature data (Washington State University, n.d.). This can be accessed from regional weather stations, but due to microclimate conditions caused by ridges, hills, lakes or other natural topography, specific on-site monitoring is ideal. Up until recently, accessing and calculating this has been relatively cumbersome, requiring multiple steps for extracting and analyzing data. Many of these models have been around for years with growers using them to time spray events to control for diseases such as codling moth (Richter et al, 2021) or fire blight. Preventative monitoring can allow for timely sprays to mitigate the spread of these disease pressures and increase the probability for the best quality growing conditions during the season. This can in turn favorably impact the quality

and volume of the fruit. Conversely, disease pressures if uncontrolled can quickly stress trees, reduce yield or even cause tree death, meaning that the energy expended on fertilization, pruning and other pre-harvest management practices are lost.

While monitoring temperature for disease pressures or weather events that can jeopardize fruit production can significantly aid in fostering the best conditions for fruit growth, they are an optimization factor, as the core components, soil, nutrients, irrigation, pruning, root-stock selection, varietal and other pre-harvest factors have a significant impact on the quality and yield in any given year. All of that work, however, can be neglected if the growing conditions are disregarded.

2.2 Postharvest Challenges and Shelf Life Extension

Losses in agriculture occur at two principal points in the production process: (1) Preharvest; and (2) Postharvest. Preharvest losses occur when yield potential is not achieved due to diseases, drought, flooding, pests, and disasters such as fire. Managing losses emanating from pests and diseases has been an ongoing battle between farmers and Nature forever. Farmers as far back as the Pharaonic days in Egypt used irrigation to manage the challenges related to drought. More than 150 years ago, American farmers were building levees to manage flooding risks on their fields (O'Connell, Ewen, O'Donnell, & Quinn, 2007). Centuries prior, Japanese and Chinese farmers were using various technologies to deal with flooding (Luo, et al., 2015). Recent infestation of desert locusts in Africa threatened famines in some parts of the continent (Cheng, 2024).

Unlike pre-harvest losses which are often visible in an orchard, field, vineyard or grove and can be dealt with relatively quickly by adjusting harvest outlooks and sales programs, postharvest losses can occur as a result of any mishandling following harvest. This can include the harvest itself, when weather conditions can compress windows for

harvesting the fruit. If a cold front delays an early variety's maturity, it can suddenly be ready for harvest at the same time as a mid-season variety of fruit, leading to significant volume on a packing line, which has volume limitations. If harvest crews are delayed, on strike or if the weather is too hot, they cannot harvest the fruit at the ideal time, meaning that it will continue to develop on the tree or vine until they can reach it. Similarly, if the handling practices are compromised, the quality of the fruit can be affected. In the case of table grapes, stems dehydrate quicker and turn brown quicker if there are delays in precooling fruit (Crisosto, 2001). This can contribute to lower market pricing.

Other touch points and areas of concern include the handling en route to or at the packhouse and storage and the final packing process and shipping via possibly multiple intermediaries en route to the end consumer sale point, and finally, the handling at the store. The changing variables, personnel load, and timing sequence required for successful handling makes harvesting, storing, shipping and selling fruit immensely challenging.

For example, cultivars that can travel a long distance include Hass avocados. As a climacteric fruit, avocados consumed in the United States represented 2.677 billion pounds (Hass Avocado Board, 2023) or over 100 million 25lb box equivalents (Index Fresh, n.d.). The steps even for a shipment from South America to Asia or the Middle East are numerous. After reaching a predetermined minimum maturity on the tree, growers and packers must carefully harvest and select the fruit that have adequate characteristics for export (Arpaia, 2014). The finished packed product is held in refrigeration until it is loaded onto a controlled atmosphere container that travels to the closest port on a pre-scheduled day, after which the truck must successfully deliver the container to the port facility and the corresponding vessel for a timely departure. The container is kept at a specific temperature

with a specific CO2 and O2 concentration during the journey to extend the shelf life of the product. Upon arrival in Japan, for example, the container is unloaded from the vessel, it is taken to a consolidation facility where it is stored and ripened before being broken down into individual pallets or half pallets that are delivered by truck to a store. The store will only display a few avocados at a time to minimize fruit spoilage.

If any of these steps are compromised, the fruit quality on arrival or after ripening could be negatively affected and a whole range of responses can occur. If the fruit arrives in poor condition, it could be rejected by the importer, at which point, the exporter has no customer to buy the fruit so that exporter has to find another buyer on the spot market at a significantly discounted price, oftentimes below production cost. If the fruit arrives with pest issues, fruit could be destroyed by port or sanitary authorities and the cost would be incurred by the exporter. The exporter would have to file an insurance claim, only if the insurance the exporter purchased covered the issue upon arrival. For example, there could be limitations on the conditions incurred that caused the fruit to go bad. If it can be shown that the container did not keep the temperature, CO2 and O2 conditions it was supposed to maintain, the insurance liability could shift to the shipping line as it could be shown that they did not keep the fruit in the conditions required for adequate transport versus if the cold chain was perfect throughout the shipping time but the fruit still arrived in poor shape. When the contents of a container of avocados, for example, can approach 50,000 USD in value, losses or adjustments can weigh heavily on an exporter's bottom line and perhaps even worse, can directly affect their brand perception and presence in the marketplace. This can even begin to affect the perception of the overall quality of the origin of the fruit in question in the destination market, which can then shape the destination market's

preference for a certain origin. In long distance fruit shipments, quality and reputation go hand in hand. For example, avocados from certain points of origin used to be excluded from the Japanese market due to having lower perceived flavor and quality than their traditional supplier, Mexico, but with improvements in the last few years, other points of origin have been growing market share in Japan.

Every point of handling following post-harvest is an opportunity to help maintain the quality of the fruit so that it has a long shelf life. From the simple introduction of forced air cooling to maintaining the temperatures during cross-docking at ports, many technologies have emerged to help extend shelf life and reduce food waste since the first refrigerated containers in the 1930s (Maersk, 2019).

In the realm of shelf life extension technologies for fruit, we can observe many approaches. Waxes such as those derived from Carnuaba have been used since the 1920s (Devi, Kalita, Mukherjee, & Kumar, 2022); gases, such as 1-MCP, have been in existence since its discovery in 1996 by Ed Sisler and Sylvia Blankenship (Reid & Staby, 2008); refrigeration has been in use since the 1930s; and the 1990s saw the emergence of controlled atmosphere as a way to extend shelf life (Prange, DeLong, Daniels-Lake, Harrison, 2005). All of these technologies, used individually or collectively, depending on the fruit, the commercial realities and expected shelf life, help maintain the desired quality. The goal is to minimize adjustments, rejections and ultimately food waste as well as financial losses for stakeholders in the supply chain.

2.3 Financial Instruments

In the supply chain, much like in other industries, the capital required to produce, pack and ship fruit while maintaining the infrastructure and conditions for production to occur requires strategic planning and optimization, especially since payment for goods take

place months following the shipment. Financial instruments such as conventional loans and specific farm loan programs have historically helped growers secure inputs needed during parts of the year. In the case of tree fruit, cash flow is critical. A large amount of capital is spent many months before the fruit is harvested. For example, the cash required can cover the expenses related to hiring labor for the growing season, chemical inputs required to grow the fruit for the season, capital expenditures to maintain or improve machinery and packing facilities, as well as the operational costs, activities and inputs for harvesting, packing and shipping the fruit to destination. They can include buying specific boxes or bags requested by customers many months in advance to paying for quality control and traceability testing.

Many large fruit companies control the supply chain after shipping the fruit, as they also market and sell the fruit in destination, for example in Asia or the United States for fruit coming from Latin America. These activities occur year-round, meaning that they likely will bring in fruit from different origins, such as Mexico, Peru and Chile, and perhaps have diversification in the commodities that they sell. This also means that they will have continuous cash flow. Other large companies may have a parent organization that can provide a cushion for operational cash flow. Smaller companies, however, rely on partners in destination markets to sell the fruit, which can be during a smaller window of time. Most fruit cultivars tend to be seasonal, and furthermore, some of those companies also rely only on one cultivar, such as apples. Expanding operations to address growing or changing markets becomes difficult when financing options are limited or prohibitively expensive. Well established shippers may own land where the fruit is grown, and this is used oftentimes as collateral for shipments. Limitations to securing lines of credit can arise

when shippers also buy fruit from third party growers aside from their own. They can demonstrate yearly income from their business operations, but they have limited collateral from physical property. Financial institutions have provided loans with a revenue-based model (Safier, 2023); however, in agriculture, up until recently with the advent of companies like ProducePay, this practice had been uniquely tied to collateral guarantees in the form of property (FSA Handbook, n.d.), machinery, breeder livestock or other assets (FSA, n.d.), which can be seized if the loan goes unpaid. For the case of many small growers or shippers, the loan terms and conditions ~~might be result too challenging,~~ could result too expensive or simply unrealistic given the risk factors associated with their operation. Financing options exist across borders but government related funding also is limited by country, for example, FAS and USDA loan programs are intended for US-related agricultural production. Growers in Mexico, Central or South America are ineligible for US government programs, even if they ship their fruit to the US . Growers in those points of origin may use financial instruments offered by their country's governments and banking system, including any government programs that may exist, such as FIRA in Mexico (Fideicomisos Instituidos en Relación con la Agricultura), which can help secure similar loan products.

For companies that have access to traditional lines of credit from banks or government-affiliated public institutions that require property guarantees, diversifying the lines of credit through newer financial instruments, such as those proposed by companies like ProducePay, can further mitigate risks. Academic research from Mexico indicates that facilitating access to different lines of credit for the agricultural sector leads to general economic growth for the sector and that generally, and that loan products from the public

sector are complementary to the private sector's efforts, "...a policy that encourages access to credit by development banks or commercial banks may have positive effects on the economic growth of the sector. (Espinoza Zamorano & Martínez Damián, El crédito agropecuario en México)". In a similar light, good business practices also encourage risk mitigation through lines of credit diversification (Carbajo, 2016). Firms who access different lines of credit reduce financial constraints (Tong, 2012). Relating to fruit growers, for example, diversifying their lines of credit can reduce the risk of a creditor-driven solvency issue or other externality that leads to a closing or change in rate for a credit line from one year to the next.

Many inputs, for example, are quoted and sold in USD in Latin America. If a local currency devaluation suddenly causes collateral property values to collapse, the following season could become very challenging for a grower as the line of credit could be adjusted due to the reduced value of the collateral. Diversifying creditors, especially if the guarantee is on income from a foreign currency transaction in Euros, Dollars or Yuan, can certainly help mitigate risks.

2.4 Blue Ocean Strategy

Kim and Mauborgne (2005) framed the idea of value innovation and strategic differentiation into what they called Blue Ocean Strategy. Its essential characteristics revolve around focusing on market segments ignored by the incumbent players and excel in delighting customers. Because competitors do not have those segments on their radar screens, firms that operate in that space are said to be swimming in a blue ocean, calm and easy. This contrasts with the cut-throat competition that the rest of the market is operating in, with many firms bleeding from the fights they are involved in, thus creating a red ocean.

Kim and Mauborgne present a number of constructs for developing blue ocean strategies. The application of these constructs allows firms to discover pathways to create value innovation that sets them up to operating in a blue ocean, or as they say, "make the competition irrelevant." These constructs can include strategies that are "convention-altering", which reconstruct and reorder "market realities in a fundamentally new way". Kim and Mauborgne organize these into their six-path framework defined to encompass and delineate how they are operationalized under blue ocean versus red ocean strategies. The different orientations are summarized in Table 2.1.

Table 2.1: Firm Orientation of the Six Pathways Under Red and Blue Ocean Strategies

Paths	**Red Ocean Competition**	**Blue Ocean Creation**
Industry	Focuses on rivals within industry	Looks across alternative industries
Strategic group	Focuses on competitive position within specific strategic group	Explores different strategic groups within the industry
Buyer group	Focuses on serving current buyers better	Redefines buyers and identifies their needs
Scope of product or service offering	Business objective is maximizing value of offerings within industry boundary	Explores complementary products and service offerings
Functional-emotional orientation	Focuses on price to alter the functional-emotional structure	Rethinks value innovation that re-orients functional-emotional structures
Time	Focuses on adapting to external trends as they occur as threats or opportunities	Shapes the external environment to transform all threats into opportunities

Adapted from Kim and Mauborgne (2005).

This thesis addresses how innovative companies in the Agritech space rely on these different pathways strategies, notably looking across strategic groups associated to the industry, participating in shaping external trends over time, and redefining new buyer

groups. All of these concepts can be seen in the Agritech space and as a result, can contribute to fostering growth for the industry.

CHAPTER III: BACKGROUND OF CASE FIRMS

In this chapter, we present an overview of the technologies and platforms that are being harnessed to address losses in the fruit sector. Case firms considered in the assessment of novel technologies being applied in the soft fruit sector to address production losses, either in pre or postharvest. The discussion is organized as follows. We first provide a broad overview of their history and their value proposition, describing their technology and the market segment into which they are positioning it. Then, we look at their journeys and explore their growth and management of growth. The final segment explores the challenges that they face in building and executing a Blue Ocean Strategy.

3.1 Environmental Monitoring Instruments

As agricultural production becomes more technical, metrics become important in decision making with regards to all aspects involved in the production of fresh produce. Everything from fertilizer inputs, production and labor schedules, and market strategies for finished goods rely on metric-driven decisions. Externalities such as weather patterns can impact immediate field decisions and dictate subsequent results or repercussions. Examples range from deciding to apply fungicides such as copper to reduce fungal pressures after a large rainfall, to applying growth regulators to buy time during harvest, to turning on fans to increase air circulation for frost prevention or to further adjusting irrigation cycles on golf courses. Managers rely on data to make decisions. A whole subsection of specialized companies exist in the preharvest ecosystem to assist companies and managers in capturing and understanding this data. Since the development of the internet, WIFI connectivity and IoT, companies have expanded their offerings to include real-time data updates and analysis. For this comparison, we will look at two traditional companies in the marketplace

(Campbell Scientific and Davis Instruments) with a strategy canvas for their weather station offerings and then discuss how Arable is redefining market boundaries in this segment.

3.1.1 Davis Instruments

Founded in the 1960s, Davis instruments has successfully grown to have a large footprint in the monitoring space and has recently been acquired by a Boston-based group, focused on weather networks. Their parent company has over 500,000 weather stations deployed around the world (Davis Instruments, 2024). Their core weather station product offerings can be found for $300 to $700 and have multiple combinations depending on the desired additional monitoring metrics required. The options include soil moisture probe, temperature sensor, and humidity sensor. While known for an expansive product offering at accessible prices to its customers, Davis's platforms are known for practicality over reliability, robustness or data analysis. Their weather stations offer the option to connect to a web based platform where users can see any other user's weather station data, known as WeatherLink (Davis Instruments, 2024) if the users opt to share the data from their station. For agricultural purposes, sharing data externally may offer benefits only if growers consult with each other for making decisions regarding spraying following a rain event in the region.

Davis Instruments internet connection platforms via an external modem which is an add on feature that requires additional setup tools. This system has evolved over more than a decade in the marketplace and offers visualization options, data export and access to publicly or shared weather station data.

3.1.2 Campbell Scientific

Considered as the standard for government and research facility-grade instruments, Campbell Scientific's (https://www.campbellsci.com/) origins stem from direct interactions with the NOAA (National Oceanic and Atmospheric Administration). The company started as a data acquisition company with its CR5 Recorder in 1975. Through software improvements, Campbell Scientific introduces its CR21 Micologger, a data logger with multiple channels which contributed to reducing the cost of data acquisition. The company has grown through rapid innovation and adaptation to the changing digital environment. In 2021, the company received a Guinness World Record for installing the highest automated altitude weather station on land on Mount Everest. A complete timeline of the company's growth is available at its website Campbell Scientific (https://www.campbellsci.com/).

The business model for Campbell Scientific focuses on servicing precision-driven companies focused on gathering customized atmospheric data on earth. The company's reputation as a high-quality manufacturer producing instruments that can work across a wide range of extreme conditions has driven its growth around the world with governments as well as private companies. Its ability to cross-sell with consultants (or "integrators") as part of solutions packages for monitoring conditions, allows the company to participate in projects with environmental monitoring as a component. This was the case with its participation in the transition to solar energy by REI (Recreational Equipment Inc.) (Campbell Scientific, 2024). These capabilities also helped the company to support Reunion Island in building its Ecocity using weather station data (Campbell Scientific, 2024). By monitoring the precise conditions in the required area, designers will be able to best understand the environmental tendencies and can implement specific building designs

that will promote ventilation and minimize the need for external energy expenditure in the form of air conditioning.

By working with a third party such as an integrator, Campbell Scientific builds relationships with other specialized companies that bring them into significant projects. One could consider this a Blue Ocean path as they bring expertise by working with a strategic group, in this case consultants, that otherwise would be impossible or very difficult to achieve.

While Campbell Scientific does not publish sales figures and is privately held, we can gather that they market themselves to consultants, integrators as well as to research organizations who depend on reliable, precise instruments with robust fidelity across different environmental conditions. A visitor on their website could also deduce that their solutions are highly customizable, that they work on a per-project quote basis and offer robust, high-precision sensing capabilities whether it is temperature atop Mount Washington in New Hampshire (Campbell Scientific, 2024) or video feed in treacherous aviation corridors for pilots in Alaska connected via satellite (Campbell Scientific, 2024) (https://www.campbellsci.com/alaska-aviation-weather). It is evident from their case studies that agriculture is part of their customer ecosystem even though they cover very large and diverse industries as long as they need weather and other environmental monitoring devices and services.

3.1.3 Arable

As a response to the cumbersome, pricey, or imprecise nature of commercially available weather stations, Arable started out in 2014 as a crop analytics platform focusing on crop health and weather risk management (PitchBook, 2024). The company offers what they have branded as the Arable Ground-Truth data, supported by its powerful agronomic

models (https://www.arable.com/). A comparison study of their instrument offerings versus other commercially available weather station compared the robustness of measurements in precipitation, air temperature and relative humidity/vapor pressure deficit (Arable Mark 2 Core Measurements, 2020). They argue that they are increasing sustainability and resilience in and across the agri-food sector. They report more than 300 customers in more than 50 countries. The company's mission, available at its website (www.arable.com/company/), is as follows:

> The need has never been greater to rethink how we feed our ever-growing population and transform agriculture's impact on the planet for good. At Arable, we believe the heart of the solution to this challenge lies in digitizing the analog world with high-fidelity data to improve human health, achieve economic stability, reduce our environmental footprint, and uplift the lives of those who work in agriculture. We come to work every day to do what we can to make a positive mark on the food system, the foundational engine of human existence in our interconnected web of life on Earth.

The company was started by a group of entrepreneurs who recognized that products targeting agri-food industry problems were either too cumbersome, expensive, unreliable or a combination. They redrew the product offering, opening up opportunities and directly addressing the agriculture space and subsequently, pursuing growing sectors within the agricultural industry brought about by climate change policies: carbon credit opportunities (Zimmerman, 2023).

Arable bases its value proposition on innovations that are simple to install and ready to work in less than five minutes. They also promise reliability of their instruments in gathering and delivering data that facilitate decision-making by those needing to make agri-food related decisions. By capturing granular data that remote-sensing systems are unable to capture and delivering the results of the analyses to any device of the customer's choosing, they offer the value of flexibility for users.

3.1.4 Summary of Environmental Monitoring Solutions

Looking at the specifications of all three manufacturers identified, they all provide metrics for the general parameters that a farmer would care about, e.g., wind, temperature, rain, light intensity, etc. They all communicate the data they collect wirelessly to customers. However, Arable differentiated itself by simplicity and ease of use. By all accounts, its products are simpler because they come as a single unit that transmits all data easily. Furthermore, the setup is easy, indicating an almost "plug-and-play" solution. Because it was the latest entrant into the market of environmental monitoring instruments among the selected companies, Arable also had the advantage of improving on existing solutions of its competitors. However, it has the challenge of establishing credibility with customers who already have existing market offerings.

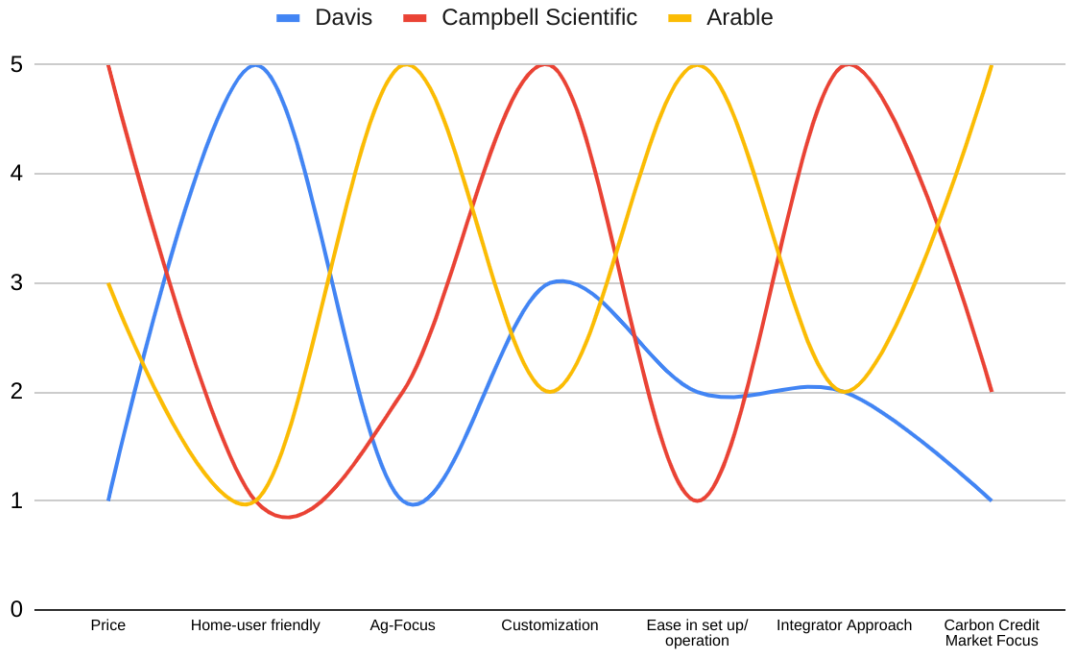
One could argue that the modifications and improvements Arable brings to the marketplace are product improvements that merits the jump for a grower from their existing solution to Arables, which are different than Blue Ocean creation. On their website, they have published studies comparing the fidelity of their instruments versus traditional competitors and show how their instruments are more precise (Arable, 2024). However, Arable focused and continues to focus on a couple of the six paths, notably: looking at strategic groups within industries and looking across time. Table 3.1 summarizes Arable's redefinition of the market based on its product offerings and framed using the Eliminate, Raise, Reduce, and Create (ERRC) framework.

Table 3.1: The ERRC Framework for Arable

Eliminate	**Raise**
Cumbersome setup	Simplicity
Home-consumer focus	Standardization
High-priced customization	
Reduce	**Create**
Price for premium quality	Ag-focused, all-encompassing device
	Value Pitch for Carbon Credits

Forging relationships with energy giants like Shell, Arable's Blue Ocean Strategy of pursuing strategic groups becomes relevant in the present, as they are participating with a significant stakeholder in the energy space, as well as in the future, as they are helping define how the carbon offsetting credits are measured and are pitching themselves as the ideal platform to roll out for these purposes as they know agriculture, their product has high fidelity, and their ease of use is seamless. When one can uniformly measure data across surface areas for the purpose of marketing, selling and buying carbon offsetting credits, having a robust measurement system that has high fidelity with identical monitoring capabilities across multiple sites helps give the market certainty that they are comparing apples to apples.

Figure 3.1: Strategy Canvas for Davis Instruments, Campbell Scientific and Arable



3.2 Post-harvest Coatings

In the world of postharvest technologies, waxes such as carnauba-based and other lipid coatings have been in use on fruit in one way or another since the 1920s. The benefits of using hydrophobic ingredients like a lipid aids in reducing dehydration and can be combined with other ingredients to achieve desired antimicrobial and antioxidative effects (Devi, Kalita, Mukherjee, & Kumar, 2022). The use for waxes, for example, in the apple industry, has been around for almost as long (Schwarez, 2017), and the application is common knowledge, and has been written about extensively in various publications (Phillips, 2017).

Many spherically-shaped fruits, such as apples, receive a coating application as part of the postharvest handling process to help combat dehydration and preserve attributes such as firmness. For consumers, this means seeing bright, shiny apples at a supermarket that also have a strong crunch even if they were harvested 12 months before going home with the consumer. As the apple industry has grown, so have service and input providing

businesses, such as those that help with preserving the aforementioned quality characteristics.

This section compares two companies performing similar functions and will consider the Blue Ocean strategies that one of them, Apeel Sciences, has pursued as part of its growth strategy. The market approach contrasts to a traditional postharvest technology supplier, Pace International's carnauba-based, fatty-acid product offerings (Pace International, 2024). This analysis will not cover the regulatory framework with which each company has gone to market, or their pricing as limited information is available. It, however, covers the marketing and sales approach used by a traditional player in the postharvest space, Pace International, versus a new entrant, Apeel Science, relying on publicly available information.

3.2.1 Pace International

Founded in the 1950s in Washington State, Pace International has grown with the industry around it, offering consumable spays, coatings, disinfectants. In 2012, the company was acquired by Valent Biosciences, a wholly owned division of Sumitomo Chemical (Pace International, 2024). The company has grown alongside the region, which itself has become the principal cherry, apple and pear growing region in North America, accounting consistently for 70% of the apple production. As a privately held subsidiary of the Japanese multinational Sumitomo Chemical, the company's profile and performance metrics are publicly available. However, its sales figures and share in the marketplace are not disclosed for any individual product.

Pace International's customers in the postharvest space are growers, shippers and packers for apples among other fruit cultivars. Pace sells the inputs directly to the operators of the packing lines where the fruit will receive the desired wax or fungicide at the ideal

concentration, for example. The pricing for this could vary but likely ends up being low on a per box basis as they will sell packers a large amount of product. Their target customer is the fruit packer/shipper. The packer/shipper absorbs the cost of the product, and the supermarket or fruit buyer negotiates a price for a program or purchase the fruit at market price, all inclusive of everything on the fruit, including the coating.

3.2.2 Apeel Sciences

As a shelf-life focused start-up from Southern California, the growth for Apeel Sciences has made a splash by receiving funding from top investors, such as the Gates Foundation. The company has experienced rapid growth since its start in the early 2010s. The premise for the inception of the company revolved around addressing food waste by harnessing lipids through a coating application (Huddleston Jr., 2018).

The core product Apeel developed is a proprietary coating that maintains the desired quality characteristics for longer periods. It has been reported that multiple fruits and vegetables have had Apeel's coating applied to them and have made their way to the supermarket. In contrast to Pace International who offers a vast array of products from the moment the fruit arrives for storage to the moment it goes on the sorting line to be packed and shipped, Apeel focuses mainly on the postharvest coating application to extend shelf life.

Another area of contrast to Pace is their customer base. Their go-to-market strategy has been very different from Pace's by selling the technology to the supermarket by demonstrating the value add and shrink-reduction at the store. Even though the intended buyer of the technology is a supermarket chain, the application for the technology is done at the shipper or packer facility, which must have an Apeel applicator device installed on their machinery (McGrath, 2018). Table 3.2 presents the ERRC grid on how Apeel redrew

the approach to the market. When compared to a traditional coating company like Pace International, Apeel has gone to market with its star product across multiple fruit and vegetable commodities. We can assume that they do not offer the multitude of products that Pace offers and therefore, can list "Non-shelf-life related offerings" in the "Eliminate" category. Apeel quantifies the product sold by cases of fruit applied versus traditional input companies like Pace that sell the product in volume, which is be diluted and applied as needed. It can be logical to deduce that the per case cost when priced as per case is higher than when it is priced per liter or gallon of input. When visiting Apeel's website, there are no technical documents related to dosage, Safety Data Sheets, and Product Labels, which echoes the target audience for their products, which are consumers and supermarkets. In contrast, Pace's website allows users to consult Safety Data Sheets and Product Labels (Pace International, 2024), which are kept by operations and quality control personnel for record keeping and eventual audits. Table 3.2 shows the ERRC for Apeel in contrast to Pace. The researcher has placed "Extended shelf life" as a characteristic that is in the "Raise" category because Apeel markets their products as focusing on this end; however, publicly available information is limited in comparisons on how it performs versus other shelf life extension coatings available on the market, such as the ones that Pace sells.

Table 3.2: The ERCC for Apeel

Eliminate	**Raise**
Non-shelf life related offerings Pricing per bulk product	Extended shelf life
Reduce	**Create**
Technical Information for Application	Brand Awareness
	New Customer Base
	Value from Waste Reduction

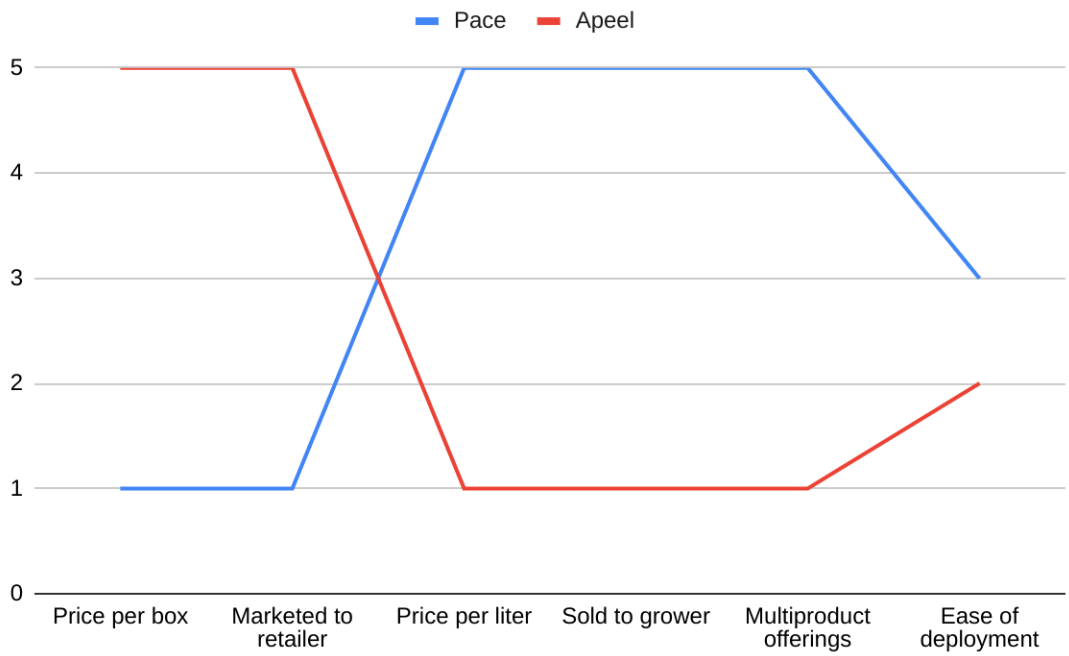
By courting supermarkets instead of growers and produce shippers, Apeel opened the opportunity to quantify the value of losses, or shrink reduction, in supermarkets, which is a whole new way of quantifying value. Participants in the supply chain use the term "shrink" to refer to the amount of product that is lost for any reason. For example, if a supermarket receives 10 pallets of tomatoes a week and sells 9 pallets, and the remaining pallet's contents are stolen or go bad on the shelf, one can say that the shrink is 10%.

Establishing connections across the supply chain beyond the traditional purchaser of a postharvest technology, the packer, allowed Apeel to reach a whole new set of buyers, selling them on the value on a per case basis, which is in the same quantifiable units they buy fruit, as opposed to selling them a volume of coating product. If the shrink at a supermarket is 15% due to overly mature fruit, and a wholesale box of avocados is $40, reducing shrink 60% (McGrath, 2018), or by $6/box suddenly creates a value per box that can command a new price point on a per box level as opposed to a per liter basis. The buyers in this case that would pay for the technology are the ones that benefit from its use, which in this case is the supermarket. In this sense, Apeel redefined the buyer group as a path to Blue Oceans by going to the retailer.

Figure 3.1 presents the Strategy Canvas for Pace International versus Apeel Sciences. The strategy canvas is built on six critical success factors: buyer audience and pricing, product offerings, and ease of deployment. In the marketplace, both companies work with large shippers who pack large volumes of fruit. However, what the graph best displays is the completely different approach to the customer base, the price formatting structure, and the product diversification. Apeel has focused on a specific customer base, offering a specific product, in a specific pricing format, whereas Pace International offers

multiple products to the traditional customer base, the companies who apply the product, with a pricing format relevant to that customer base.

Figure 3.2: Strategy Canvas for Pace International and Apeel Sciences



3.3 Innovations in Financing Operations

For fruit growers to palletize boxes of finished fruit, a plethora of logistical, financial and physical activities precedes the palletization. The entire process in the orchard, grove or vineyard requires inputs and extensive hand labor including some activities such as planting root stock and grafting new varietals that will not fully produce fruit until 4 to 5 years later. The yearly pruning, fertilizing, and trellis guidance needed in an apple orchard, for example, can run close to 6,000 USD per acre for small growers (Good Fruit Grower, 2016). In the case of blueberries in California, estimates approach 15,000 USD per acre for production. These expenditures occur before the fruit sells in the marketplace, meaning that these growers must finance the operational costs per acre to

produce and sell the fruit, hopefully making a profit on the returns. For many cane fruit and tree fruit varieties, pruning costs begin to incur over winter and the returns from the next crop may not arrive for many months, meaning that operators must seek financing to get through the season. In some countries, certain fruit cultivars are exported and marketed exclusively through a cooperative, as is in New Zealand via Zespri. They are able to provide growers payments before the fruit is sold in anticipation of the sales to come (Zespri Pool Policy Manual, 2022). Zespri generates revenue from fruit grown outside New Zealand as well as from all fruit sold that was grown in New Zealand for export.

In other geographies, growers might be vertically integrated, they may have a parent company or be part of a marketing organization that can help finance their operations during the capital-intensive pre and post-harvest operations. When growers are not part of a cooperative or marketing group that includes financing options, growers must rely on other sources of funding to begin seasonal operations

3.3.1 Accessing Operational Financing via Government Assistance Programs and Conventional Banks

Governments around the world recognize that financing agricultural operations are challenging and have set up assistance programs (Farm Operating Loans, n.d.) to enable growers to access loans. This often requires one key element: collateral as a guarantee. In other countries similar programs exist, with similar requirements, having a guarantee based on goods currently on site or on the property itself (Fideicomisos Instituidos en Relación con la Agricultura, n.d.). This source of capital requires collateral guarantees that are present before the start of the season, in the form of inputs, machinery or property. While logical and beneficial to those that can access this funding, this practice limits growth and

diversification opportunities for companies that require sourcing for immediate or advance payments to growers, much like what Zespri does in New Zealand.

3.3.2 ProducePay

Founded by a grower, ProducePay, seeks to provide upfront funds for growers. They seek to fill a gap in the marketplace by providing relief for start-or-mid-season challenges and addressing opportunities. They do this by using future production as the collateral. Based on their historicals, their destination markets, customer base, commodities and experience, ProducePay provides upfront capital required for them to operate their business prior to getting returns on the sale of their goods. Their services have been evolving since they started operations in 2014. This permits companies to access capital when they do not fit the profile that a traditional lender requires to access financing. For example, companies who source fruit from multiple growers may not have property, machinery or other inputs that are useful as collateral, but they do have signed contracts and historicals showing that the same companies have been doing business with them for years, which as aforementioned in this study, the industry is relationship driven.

Such is the case of Berry Sunny International, who was able to get financing through ProducePay at the start of the season to purchase fruit from growers who otherwise would have sold their fruit to the competition (ProducePay, Berry Sunny Leverages Quick-Pay to Strengthen Grower Network and Fuel Expansion, n.d.). The payment structure for ProducePay involves three steps after receiving approval and signing contracts defining the loan amounts and terms. The first step is that ProducePay provides growers funds up to a specific percentage of their production. The second step is that ProducePay requires a grower's customer, in this case, the receiver in the destination market, to directly deposit

funds into ProducePay's account. ProducePay will recuperate the agreed upon loan percentage plus the loan amount itself and then sends the rest to the grower. Recently, the company has raised 38 million USD, and also offers companies connections with their client list, who include retailers, importers and suppliers.

In addition to creating a Blue Ocean by addressing the financing needs of a new customer base, they serve as a hub, providing connections for "verfied" buyers or suppliers, optimizing the supply chain and removing "low value-added" intermediaries (Wiggers, 2024). Figure 3.2 presents how ProducePay compares to traditional banks. Their value proposition is only similar in that they also offer financing to growers. Their applications are less onerous, their collateral is based on future production and their client network up and down the supply chain allows for mutual benefit. It is to ProducePay's benefit for the companies they loan money to be successful in getting paid, and simultaneously it is to the companies with loans from ProducePay's interest to bring back as much revenue as possible. For traditional banks, the spirit of the loan or the financial movement is more distant as they are disconnected from the supply chain, and they are satisfied if companies are successful or unsuccessful with their season, meaning that if loans are not repaid, they are assured their investment is protected by seizing assets.

The strategy ProducePay deploys is to court a similar customer base, but are truly engaging in Blue Ocean Strategy by redefining buyers and addressing their needs. Traditional growers and companies who amass volume from other growers to sell are overlooked or otherwise unaddressed by previously available market instruments. Whether the documentation and time commitments required to access the funds was too long or simply the ineligibility due to lack of physical collateral invalidated their application, many

companies within this space sell and buy produce on a yearly basis. By focusing on the future value of the expected production and helping secure the contracts from pre-verified buyers or sellers, ProducePay not only is redefining the buyer group but they are looking across complementary service offerings by connecting customers with "verified" buyers, therefore exploring two different Blue Ocean paths. Through this, they are even helping to bypass intermediaries, maximize the margin for buyers and sellers, and further cement their growth in the marketplace.

Figure 3.3: Strategy Canvas for Traditional Bank Loans and ProducePay

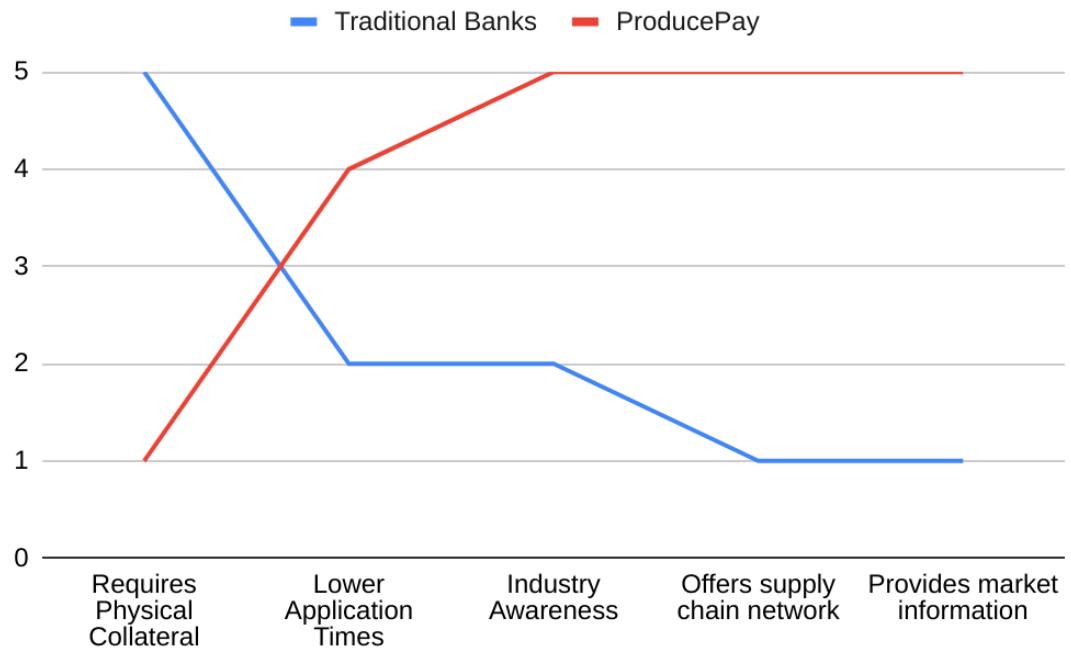


Table 3.3: The ERRC Framework for ProducePay

Eliminate	**Raise**
Cumbersome paperwork	Ability to access operational capital
Reduce	**Create**
Livelihood collateral exposure	Network of verified buyers
Transaction risk when selling	Create value for futures

3.4 Impact of a pursuit of Blue Oceans by these companies

All of the companies that are new entrants in their respective fields have published success stories about the impact of their business model on the greater industry. The commonality across all three is that they are seek to address challenges in the supply chain, and are employing Blue Ocean Strategies to make it happen. As private companies, financial data is confidential, unavailable to the public; one way to quantify their economic impact is to quantify the amount of capital they have publicly fundraised. Arable has raised 40 million USD in a C round (Businesswire, Arable Raises $40 Million to Accelerate Sustainable Agriculture) in 2022, Apeel raised $250 million in an E round (Hall, Tech Crunch, 2021) in 2021, and ProducePay has raised $38 million in 2024 (The Packer, ProducePay raises $38M in Series D Financing), with backers including noteworthy names such as Syngenta Group Ventures. All of these achievements speak to the viability of the vision they have for the marketplace and for the impact they can have. While their long-term efforts will be qualified and quantified in future years, their short-term impact has been significant for direct beneficiaries across the entire supply chain: growers, shippers, exporters, importers, traders, retailers and consumers.

CHAPTER IV: SUMMARY AND CONCLUSIONS

The research explored the extent to which innovation-driven technology firms in the fruit and vegetable industry pursued Blue Ocean Strategies and whether they have the potential to change their industry in the process. In this final chapter, we present the summary and conclusions of the study. These are presented in the first two subsections. The final subsection of the chapter presents some observations for future research in this field.

4.1 Summary

In the first group of companies related to weather monitoring instruments, new entrants such as Arable are deploying the Blue Ocean Strategy of looking across industries and time. They are taking the existing framework of traditional weather station monitoring and focusing on producing a robust, solid product for an underserved or frustrated customer base, growers. Furthermore, because of this focus, they are able to take two additional Blue Ocean paths: that of molding a new customer base over time by becoming a standard in monitoring solutions for carbon offsetting-based credits, which require consistent, robust comparable measurements that can be easily deployed and have the credibility from growers required.

In the second group with regards to postharvest management, new entrants like Apeel are courting a new buyer group as a key Blue Ocean Strategy pursuing the value created when shrink is directly addressed with the supermarket chain and defining the supermarket as the main customer in the strategy.

Finally, in the third, new financial options, such as ProducePay are engaging in a Blue Ocean Strategy by redefining the buyer group, allowing reputable growers and shippers to access credit lines that were previously either inaccessible or limited in

availability due to the nature of their operation. Furthermore, ProducePay also paved a new Blue Ocean strategy by offering complimentary services that continuously benefit their customer base.

4.2 Conclusions

All three companies have been around for at least 10 years, have received multiple rounds of investment from diverse funding sources and are putting to the test their vision for success in the marketplace. While competitors have arisen in the ten years, the combination of marketing, speed of deployment and salesmanship has certainly kept these companies in the spotlight.

One could conclude that their areas of focus are tailored for the challenges of their time: whether it is input resource optimization or frost prevention in an orchard, reduction in risk for food waste due to transit or handling or simply having healthy access to capital to enable growth, service providers are recognizing the 21st century challenges and engaging the supply chain with Blue Ocean Strategies.

4.3 Observations for Future Research

Revisiting these three subsectors within the supply chain for fresh produce over the next 20 years may shed light to changing trends and the overall impact that Arable, Apeel and ProducePay will have had for the greater industry. Perhaps some will have been publicly traded, purchased or have changed product offerings, services or strategies to avoid red oceans. It is notable that 20 years ago, none of the three companies existed, and as they navigate Blue Oceans by deploying tangible strategies, participants in the supply chain will continue to benefit from resource optimizations, innovations, and research that these and other entrants in the space bring to the industry.

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