



CalfSMART: A New Technology Venture from New Zealand

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Abstract. This case is set within the agricultural sector of New Zealand's primary industries. It analyses the early stage growth pathway of CalfSMART, a start-up company which has developed a technologically advanced calf feeder system. As this opportunity is now developing successfully, the team are seeking to grow the business world-wide. This case analyses some of the key decision points that the firm has faced, illustrating issues of leadership, strategy, innovation and marketing. The case demonstrates the formal and informal processes undertaken by entrepreneurs in the very uncertain period of new technology development.

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1. Introduction

This case is set within the agricultural sector of New Zealand's primary industries. It analyses the growth decisions of CalfSMART, a pre-revenue start-up company which has developed a technologically advanced calf feeder system. As this opportunity is now developing successfully, the team are seeking to grow the business world-wide. This case analyses some of the key decision points that the firm has faced, illustrating issues of leadership, strategy, innovation and marketing. The case would best suit students on courses of innovation, entrepreneurship, technology management and strategy.

2. Learning Outcomes

On completing this case study, students should be able to:

1. Discuss the challenges of growth facing technology start-ups.

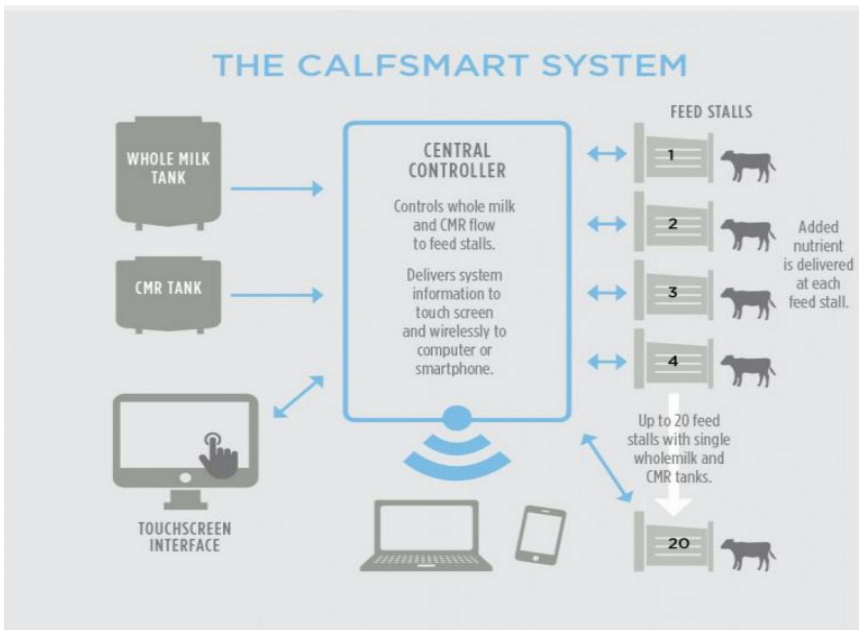
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2. Identify different ways forward for the firm in terms of business functions including leadership, strategy, innovation and marketing.
3. Assess the challenges of the key decisions around internationalisation and technological direction.

3. What is CalfSMART?

CalfSMART is an automated calf rearing system designed for dairy farmers who want to make precise decisions on how to feed their calves for optimal health and growth. The flagship product is a combination of an automated milk feeding hardware driven by a wireless software platform. To put it simply, this is ‘smart’ calf feeding technology that takes a good portion out of the work of rearing calves. The automated calf rearing system dispenses the right amount and optimal mix of milk for each calf, determined by its age (identified through its RFID ear tag) and its weight on entry into the system’s feed stall. Thus each calf automatically receives the right balance of nutrition. The information received when a calf enters the feed stall is sent wirelessly to a smartphone or computer enabling the farmer to monitor each calf. As well as being smarter than other available systems, CalfSMART is also designed for larger-scale rearing operations - scalable up to 2000 calves.

Figure 1: The full CalfSMART system



Installing the milk feeder system does require investment of time and resource as it is expensive, and further, the milking shed has to be reconfigured. There is also training needed to ensure the farmers and indeed the calves are using the system effectively. Of course, this is quite an intrusion for farmers. In response to this feedback, Ben has produced a second product, a solar-powered pellet feeder system, which can be used in the field, and doesn't need installation. While this is less sophisticated than the milk feeder, it addresses the same customer need, in terms of managing and monitoring the feed access and response of a particular calf.

As Ben states, *“It's all about animal welfare. With the data we get from each machine we can really build a picture of the health of an individual calf and chart its progress through the rearing period. Automated feeding also reduces labour time and feed costs and, ultimately, ensures no calf is left out.”*

4. The Innovation Context: New Zealand to the World

Developments in 'precision farming' such as CalfSMART are supported by the New Zealand Government which has a strong focus on agri-business. This sector exceeds all other sectors in size; only tourism contributes a similar amount to New Zealand's Gross Domestic Product (GDP). CalfSMART could contribute to New Zealand's dairy industry, which is its biggest export earner, generating NZ\$17 billion in the year to December 2014, and accounting for 34 percent of total primary industries exports and 28 percent of New Zealand's exports. Its largest market is China, followed by the United States and the United Arab Emirates. Milk powder, butter and cheese are in particularly strong demand. The New Zealand Trade and Enterprise website proudly states that “New Zealand is the largest dairy and sheep meat exporter in the world, and a major global supplier of beef, wool, kiwifruit, apples and seafood. New Zealand-grown produce feeds over 40 million people, with 7,500 animal products and 3,800 dairy products going to 100 countries every month” (NZTE, 2017)).

Agri-business is therefore central to the New Zealand economy and technological innovation is helping to drive efficiency, productivity and sustainability (Vitalis, 2008). Technological innovation is one of the reasons New Zealand agri-business is competitive and technology is radically affecting every aspect of New Zealand farming from paddock to plate. New Zealand's agricultural innovation track record dates back to the first refrigerated meat shipment in 1882. The invention of the electric fence in the 1930s, was another early landmark in pasture management (Brown, 1983). Agriculture has continued to keep pace with scientific development; for example, in 2013, dairy science's first genomically-selected bulls were produced here (Spelman et al, 2013). Continued efforts to lift the quality, productivity and performance on farms have led New Zealand companies to innovate in all areas, including milking machines,

irrigation and animal genetics. There are tremendous opportunities to add value to commodities by marrying two of the biggest export industries - agriculture and technology. Already, the AgTech sector exports are worth NZ\$1.2 billion annually (MPI, 2015), providing a good grounding from which to work.

The infrastructure to support innovation is strong in New Zealand. The government invests around NZ\$30 million annually into research and development focused on improving agricultural productivity and profitability. A world class higher education system in agriculture, combined with innovation support through the Callaghan Innovation fund provides rich opportunity. A maturing venture capital industry has already poured NZ\$9.8 billion into nearly 800 agribusiness companies in 44 countries around the world since 2005, smoothing the path to take New Zealand's innovations to the world (NZ Herald, 2015)).

New Zealand's small population, relatively permissive policies towards setting up business and abundant space, make for an ideal environment to test and incubate new technologies and new models. Improvements can be introduced, tested and trialled onshore, then adapted for use beyond New Zealand, which provides a test-bed for developments that can then be offered worldwide. For example, the use of farm management software is already reasonably widespread in New Zealand, robotic dairy sheds are beginning to emerge and, the use of drones to patrol vineyards and pastures becoming more widespread. With a regulatory environment open to experimentation, New Zealand can offer a perfect place to incubate and further develop world-leading drone technology to be a valuable aid to the agricultural sector. (NZ Govt, 2015)

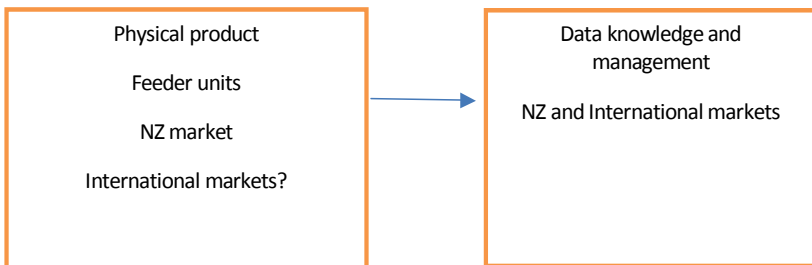
5. Identifying and Developing the Opportunity

From the above, it would seem that the New Zealand dairy context would offer fertile ground for new ventures such as CalfSMART. However, although dairy farming is big business in New Zealand, it's not plain sailing. Farmers in the dairy industry, the end customers of much AgTech innovation, have struggled in recent years as products such as milk powder have fallen in price on the world commodity markets, reducing their earnings, and an outcome over which they have little control. Therefore, while there are strategic opportunities for innovators, there are also pressures on their potential customers to survive. While there might be the need to implement innovations, hard-pressed farmers, may have little time not only to find out what is going on, but also, more importantly, to step back and take the time to implement and optimise new, unfamiliar systems. Farmers also have a tendency to be risk-averse and conservative in their thinking. Implementing new technologies can seem like a daunting and risky challenge, when they have little resource to spare. Yet for dairy farmers to remain competitive on the global stage, one area where they have to excel is in the

effective and efficient rearing of calves. There are an estimated 4.9 million dairy cows in New Zealand; those cows produce around 1.4 million calves annually. How calves are reared is important, as it is increasingly recognised that careful management can have a significant effect on the lifetime milk production of a cow. This means that the growth rate of calves has to be assessed in relation to the feed they are supplied. At present, there is no way of knowing how much supplied feed an individual calf has taken from a feeder, or how that relates to the growth of the calf. Thus, the main value proposition of CalfSMART – the technology at the heart of this case, is that through precision farming, improved animal welfare can be achieved, labour time and feed costs reduced.

A 36 year-old entrepreneur, Ben Neal, a mechanical engineer originally from a dairy farm in Dannevirke in the Taranaki, a rural region in New Zealand’s Central North Island saw an opportunity where New Zealand could lead the world. A New Zealand approach was needed, because overseas systems, as well as not using the latest technology, having been around for 20 years, were also unsuitable for New Zealand because of differences in herd sizes. In the EU for example, herds are typically of the order of 130 animals, a third of the size of an average New Zealand herd. Importantly, Ben saw the situation not just as a matter of designing a mechanical system for a particular herd size; at an early stage he saw the opportunity of using new thinking around ‘big data’, developing software products around the data produced by the system. Thus, analytic packages could be created to support farmers and other stakeholders in the dairy industry, that are currently unavailable. This could occur in milk production all over the world, not just in New Zealand. Initially, data may be used to optimise feed regimes to animals, to generate individual animal reports and create history and traceability for a particular animal. This precision regarding history and traceability is seen as very significant in the food industry, particularly for premium products, that tend to ‘tell a story’ in their branding. Data can also be sold to feed manufacturers, providing a direct channel to their customers. Currently, there are no competitors in this marketplace. Although the hardware may easily be imitated over time, the software developments and the collection of data linked to the hardware are more difficult to copy!

Figure 2: CalfSMART – hardware and software – “the product”



In the initial stages of the venture, Ben's primary market focus is the New Zealand dairy industry, which is approximately 12,000 herds (DairyNZ, 2016). Ben's goal is to capture 10% of this market, and he estimates the value of the firm to be between NZD2-10M in three years. Ben has to operate in conditions of uncertainty around the potential size of the CalfSMART opportunity overall, because of the uncertainty of the software aspect, compared with the risk of the mechanical system. Sarasvathy (2001) sees some entrepreneurs as working in a space where there are many unknowns and the future is unknowable – yet they are able act in such a way as to not only react to events, but to shape the future. In this view, which Sarasvathy has defined as “effectuation”, entrepreneurs start off by asking themselves certain questions: Who am I? What and who do I know? In this way, they assess what they might conceivably do. The next step is to interact with potential stakeholders who are willing to work with them, and together, morph the idea into what is doable. While assuring that any losses are affordable, they invite and encourage new ideas that can support growth in unanticipated directions.

Ben gained a BEng (Automation) from Massey University nearby in Palmerston North, a leading international university in agriculture, and the largest agricultural service town in the region. Ben also has a New Zealand Certificate in Engineering (Mechanical) qualification and so understands the practical and technical aspects of practical mechanical engineering. After life at Massey, he worked in the UK as a field engineer and in business development in the offshore oil and gas sector. After studying calf-feeding operations while on holiday in Denmark seven years ago, Ben began to think about producing a more efficient system to help New Zealand's dairy sector rear their calves more successfully.

"Due to my dairy background I was keen to learn how the industry was working over there. I was seeing these European products being imported into New Zealand in an attempt to fit New Zealand farming practices - which they did not do well."

In effectual terms, Ben had a good sense of what he knew and where he might be successful. Thus, Ben founded CalfSMART after returning home to New Zealand following his stay in Europe. He was spending some time on the family farm rearing calves when he had his 'ah-ha!' moment as to how he could improve things! He then set about developing a product with a close friend Greg. Now based in Palmerston North, Ben and his team have been developing CalfSMART for the past five years. With the fourth version of the technology now in the bag, Ben says he is happy with its progress, although he expects there will be further improvements in future, primarily around the data reporting to farmers. This development around data provides the opportunity to impact global markets much more effectively, as software is easier to support and install than expensive machinery. This new growth opportunity arose during his interactions with knowledgeable stakeholders in the business development arena in Palmerston

North. Ben sees the data side of the business as potentially more profitable than the mechanical systems, as data systems and sales are easier to implement internationally. While this has yet to be proven, the data side of the business will only be successful if enough components of the CalfSMART system are in place on farms. He needs to work on both sides of the venture – hardware and software – in conditions of great uncertainty supported by working with customers and stakeholders. He needs to ensure that the business grows organically towards sustainable revenue streams, while being cautious with borrowed funding. This process is often referred to as ‘crossing the Valley of Death’ (Barr et al, 2009) and is a phase where the new venture will be very vulnerable to cashflow issues. A significant challenge to CalfSMART is cash flow across a year that is dominated by the seasons in the farm calendar, not by the firm’s needs of buying in materials, producing the systems and getting them ready for implementation. Business owners prefer to smooth costs over the year; calving takes place twice a year. Farmers, being human, tend to worry about problems that are close to hand. There are certain times in the year when they are just not worried about calving at all, as their minds are taken up by other urgent needs. But then when calving gets really close, they want the system NOW, if not yesterday!

6. Getting CalfSMART Underway

CalfSMART was incorporated in March 2014 as a start-up company. Two other Directors joined in August 2014 and the company is now close to 3 years old. Ben acts as the CEO and leads the R&D. Ben also works closely with his Advisory Board, which includes successful local entrepreneurs and businessmen. CalfSMART is still a small firm, employing two programmers, a sales director and a workshop manager. Ben prides himself on his skills in understanding all aspects of the business as CEO, including R&D as well as sales and marketing.

To get the firm underway, Ben needed funds, as he had quit his job. Ben is a serial entrepreneur and he funded the development of CalfSMART from the proceeds of another start-up called Farmspec, which he had founded in 2012. This was a successful firm based on his experience in the energy sector, providing irrigation and environment monitoring services. However, when the potential of CalfSMART became clear, it was obvious he had to turn his full attention to developing the product further and building the company through equity funding. To achieve this aim, in their early days, the company were supported by the Building Clever Companies (BCC) incubator based near the Massey University Campus in Palmerston North. BCC is a specialist business development organisation for start-ups in agriculture, agri-tech and agri-food. They also use their expertise in tech transfer, start-ups and investment to help entrepreneurs and innovators take products to market. Support for CalfSMART included office facilities, mentoring, assistance with customer validation and marketing training.

Ben approached the BCC initially to assist with product development. As is usual where start-up companies are concerned, the BCC did so much more, building the company and a pathway to funding as well as getting support for product development. As well as developing new industry-specific networks for CalfSMART, they identified the need for Ben to complete some rigorous early stage research and development. They assisted him in gaining a ‘Getting Started’ research and development (R&D) grant of NZ\$25,000 from Callaghan Innovation, New Zealand’s national support organisation for new innovations. After a successful R&D project, Ben completed his prototype, and working in tandem with BCC decided to raise his first round of seed investment. BCC worked closely with Ben over five months to aid Ben’s decision making through:

- Testing the market for the opportunity with the farming community: a strategy was defined where CalfSMART would work with a small group of dairy farmers to build convincing case studies to actually show other potential customers the value of the system in a real setting. And of course, that provides the opportunity for them to iron out any ‘teething troubles’ at an early stage.
- Defining and building an intellectual property strategy: a milk feeder system has been patented and a pellet feeder patent is in process.
- Building an Advisory Board of industry experts to assist in strategic decision making
- Developing business plans to support capital raising
- Raising a seed investment round of NZ\$160,000 from investors in the sector: since this initial seed investment a further NZ\$1M has been raised.
- Thus, the new system was ‘launched’ to the public at the Central District’s Field Days in March 2015 and gained substantial interest from this first outing.

Moving Forward: So What’s Next?

Ben sees two big opportunities for the firm going forward. Firstly, he wants to develop applications that make more use of the huge volume of data that is generated and collected by the system. He sees the possibility of creating more value from the system and perhaps creating new data-driven services. Secondly, he wants to take the system out to the global market, which would involve setting

up a new division, at first either in the European Union or the USA. This would extend the reach of the company, while of course requiring the management of growth involved. Ben is proud of the track record he has created in New Zealand to support the next phase of growth.

As Ben states,

"Our machines are Kiwi engineered and robustly designed for New Zealand's farms and weather conditions. The technology is ours and the system is basically a league above what's currently out there."

1. What direction to adopt in terms of product development?

The firms' strengths are around both hardware and software, with big decisions coming up around the balance between more hardware development or more development of the data produced by using CalfSMART. If the firm moves towards developing more data applications, becoming more of a knowledge management firm than a hardware company, then it will need to put its resource and effort into developing the data mining infrastructure. The switch from being a product focussed company to a more customer-oriented company is a work in progress that needs careful reflection and strategic thought.

2. How to internationalise effectively

The current growth strategy is to focus on the New Zealand market with a view to internationalising later. There is a need to get the "traditional" farmers to shift their thinking about herd management to a 'smarter' mind-set locally and this can take time. However to achieve their desired growth, they must internationalise within two years.

Issues of how to resource the development of new products and services, and also, how to manage future growth, are not, of course limited to start-up firms. But technology start-ups are particularly vulnerable as they operate in risky and uncertain conditions. This is due to rapid technological changes over which they have no control, and also limited resources to commit to development. This means CalfSMART must face particular challenges in key management areas – leadership, planning, innovation and enterprise and sales and marketing.

CalfSMART has much in its favour. It has technology that is working and either patented or in the process of being patented. Ben is very committed to the firm and has assembled a network of sound advisors from the business community and still has good relations with the BCC. He also has good relationships with the farmers who are testing his products and he has responded to their feedback by building the pellet feeder which overcomes the set up costs of the milking system and is quick to install. For Ben, it generates more revenue, but more importantly gets the data generating technology he needs for the software business out in the field. He is currently keen to build a global company himself rather than sell to an incumbent with existing distribution channels, but that could change over time.

On the less positive side, the firm is pre-revenue and needs to build its own revenue streams quickly. This is driving Ben towards a speedy internationalisation strategy, which spans both mechanical systems and software. While the New Zealand government provides access to support for innovators, overseas export is always risky, particularly at present when trade agreements and tariffs are going through a volatile phase. Ben's effectual strategy, based on what he knows, is stretched here and he will need to learn and to succeed quickly. The data products are easier to export, and could yield more revenue than the mechanical side of the business over time – but this side of the business is less well developed. Is the firm trying to do too much in developing both hardware and software? Could Ben run out of time?

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