Gap Analysis of Startups in the Agri-Tech Space

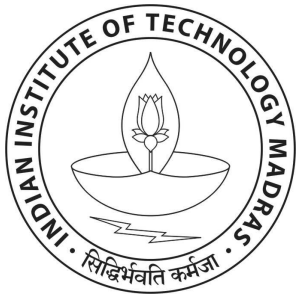
A Project Report

submitted by

NIRMALRAJ B V

in partial fulfilment of the requirements
for the award of the degree of

BACHELOR AND MASTER OF TECHNOLOGY



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THESIS CERTIFICATE

This is to certify that the thesis titled **Gap analysis of startups in the agri-tech space submitted to IIT-M**, submitted by **Nirmalraj B V**, to the Indian Institute of Technology, Madras, for the award of the degree of **Dual Degree (B.Tech and M.Tech)**, is a bona fide record of the research work done by him under our supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

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ABSTRACT

There are 474 agri-tech startups across the supply chain in India. The key to entering the market is to understand the customer they are serving. This study has been carried out to understand the gaps in 3 such startups. Data was collected from both the startups and their customers. Over the course of the sturdy the mindset of different kinds of farmers was mapped. The data led us to the most important problems in agriculture according to the farmers. Different business models of startups have also been discussed.

KEYWORDS: Agri-tech startups; farmer mindset; agri-consulting; access to credit; cold storage supply chain

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ABBREVIATIONS

IITM	Indian Institute of Technology, Madras
y-o-y	year on year
B2C	Business to Customer
B2B	Business to Business
B2B2C	Business to Business to Customer
CIBIL	Credit Information Bureau India Limited
FPO	Farmer Producing Organization
NGO	Non-Governmental Organization
NBFC	Non-Banking Financial Company
RBI	Reserve Bank of India
TAT	Turnaround Time
EMI	equated monthly installment

CHAPTER 1

INTRODUCTION

India has more than 450 agri-tech startups working towards helping farmers in various aspects ranging from finance, technical inputs, products, marketing, transportation, drones, machinery for rent and so on. The startups have proven to provide good value to farmers across India but the growth trajectory has not been up to expectations. Successful on-boarding of the farming community is a difficult task. The technology penetration in India is quite low except for a few progressive regions. Other challenges such as regaining farmers' trust after their bad experience with a former player, establishing credibility since the farmers pride their own knowledge and methods over receiving advice from an outsider etc. are constantly faced by the startups in this space.

Over the course of this project I would like to better understand what the farmers look for when approached by a new company/startup (*i.e.* model farms are preferred in most regions but it is a big cash burn for startups). The B2C model is almost close to an impossible task for a startup. Most villages are in remote places and the products/services will need a team in each village to run operations successfully but to be profitable the startup has to have a certain number of customers. Getting the buy in and trust of the farming community is a mammoth task.

The farmers fail to understand that their pay-off from using the product/service is quite high. I would like to understand and model the pay off for a few startups (*e.g.* the cost reduction and revenue increase when you use BharatAgri, an agri-tech startup is 15 which amounts to ₹15,000 if one cultivates an acre of chilli. The cost of their service is ₹800 for 6 months). Even the ones who buy the service don't understand the importance of following the advice. The reduction in cost cannot be realised when farmers adapt to unscientific practices and apply excessive fertilizers and pesticides which defies the very premise of the startup's offering. The other sources of information for farmers in a village are the representatives from companies, fertilizer store dealer and progressive farmers. There isn't a guarantee that these people will act on the best interests of the farmer.

Access to credit is another fundamental need for small scale farmers. The government mandates banks to provide loans farming and allied sectors. But the effect of this is dependent on the reach and availability of banks in rural areas. More often than not farmers do not have access to credit. The loans are provided based on the availability of collateral which again is an issue for the poorer farmers. The bank's loans can only be availed for specific purposes which don't cover all the needs of the farmer. A farmer needs credit frequently but these small loans are not financed by banks. This leaves them at the mercy of money lenders. There is a rise in micro finance and private institutions across India but not haven't quite cracked the market yet.

Crop worth $19.4 million is wasted in India on a daily basis only due to rejection at farm gates and delays in the distribution process. There have been efforts since independence in building transport infrastructure to enable transportation of goods and services. What would be the point of producing more if their value is not realised. The state governments are building cold storage infrastructures for the farmers at nominal storage costs. There's still a good amount of loss at a farmer level. The loss of goods in dairy industry is quite huge as well.

After my experience at BharatAgri doing research across Andhra Pradesh talking to farmers I realised the gap in offering and understanding of the market. In this project I have studied three startups in detail and also collected data from their customers trying to understand their needs, decision make and the impact the startups have had on their lives.

Objectives

1. Gap analysis in offerings and mismatch based on usage, sustainability, financial ability.
2. Understand the various stakeholders in the system.

Agri-Tech Landscape in India

Indian Start-up Ecosystem

India is the third-largest start-up hub in the world following the USA and China with huge growth opportunities across a plethora of fields. The Indian start-up system is growing steadily with more than 1300 start-ups added in 2019 itself and a 12-15% y-o-y growth. Agri-tech start-ups constitute only 2% of the total start-ups in India (Fig. 1.1).

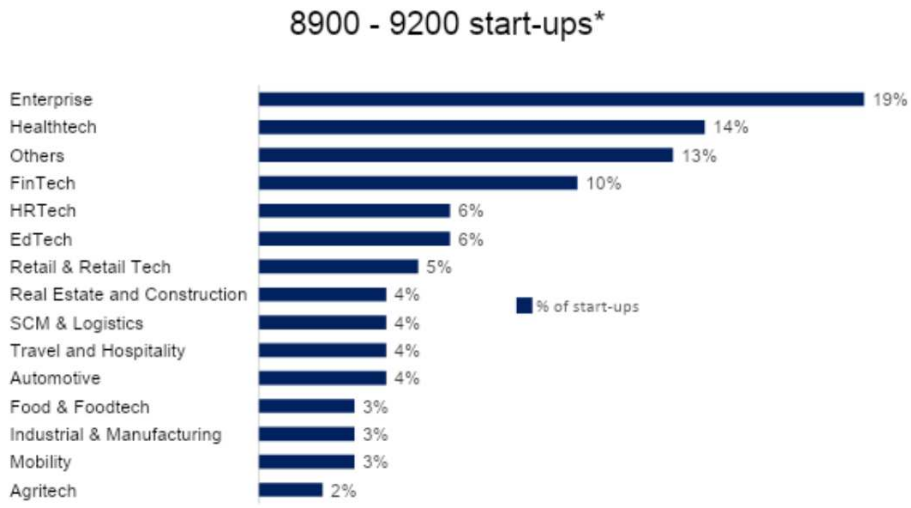
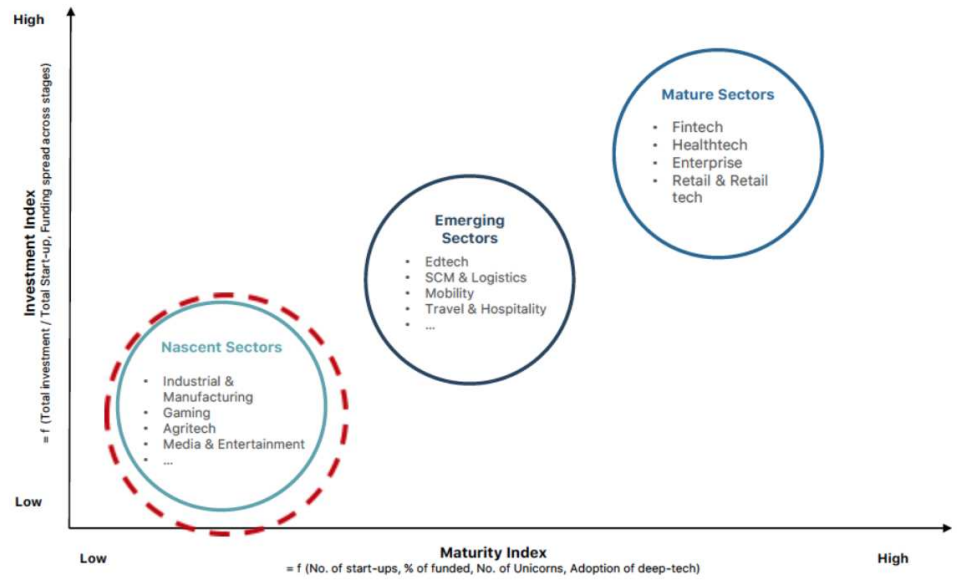


Figure 1.1: Composition of startups in India

Agri-tech Start-up Ecosystem

Agri-tech startups in India are still at a nascent stage (see Fig. 1.2) with a presence of more than 450 startups and growing at 25% y-o-y. Agri-tech has the potential to solve the challenges posed in India's agricultural system owing to the pattern of budding start-ups, emerging technology usage, internet and smartphone penetration, favourable government initiatives etc. Every 9th agri-tech start-up in the world is from India with 5 out of the Top 10 global agri-tech companies being from India according to Tracxn (G. Umang and Gautami (2019)).

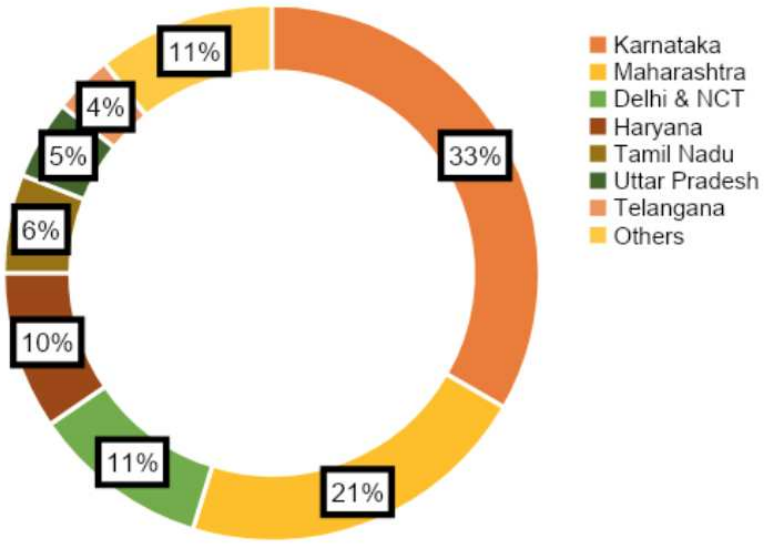


Source: NASSCOM

Figure 1.2: Maturity of sectors (NASSCOM and Zinnov (2019))

Geographical Presence

With reference to the number of agri-tech startups, Karnataka and Maharashtra together account for more than 50% of agri-tech presence in India. It can also be observed in Fig. 1.3 that these startups are more concentrated in the established hubs of India like Bangalore, Mumbai and Delhi.



Source: Tracxn

Figure 1.3: Statewise composition of agri-tech startups (G. Umang and Gautami (2019))

Sectoral Presence

Precision Agriculture	Companies developing technology applications to improve farm data collection, data analytics and reduce agro-chemical application and field operations budget using industrial automation
Market Linkages/ Farm Input E-Commerce	Companies providing digital platforms to link farmers to farm inputs and farm produce markets, agronomy information and finance
Agribusiness	Companies using modern cultivation practices and technology for production and processing of agricultural commodities
BioTech	Companies engaging in research on plant and livestock animal life sciences and producing products for various segments of the Agri value chain
Farm Infrastructure	Companies developing infrastructure and components for various modes of agriculture including soil-less farming
Supply Chain Tech	Companies developing technology solutions for post-harvest produce handling, storage, quality check, processing and providing them as a service or product
Farm Produce E-commerce/ Farm Business Management	Companies providing on-premise or cloud-based software products for resource management in field crops, livestock, and aquaculture farms

Table 1.1: Key subsectors in agri-tech sector

CHAPTER 2

METHODOLOGY

The research involves a systematic study of the agri-tech startup space which includes an overview of the startups' journeys, the customer decision-making process and the factors behind it. To do the same, two sets of semi-structured questionnaires were prepared for startups as well as customers with customisations made based on the service and product. These questionnaires are only used as a leading point of discussion with stakeholders and are not strictly adhered to. Flexibility is allowed in the path of discussion and questioning. The rationale behind this decision was that by having a more open-ended discussion with the startups and customers it would be possible to get more information and insights about the market and agriculture in general.

2.1 Startups

Three startups were chosen across the Agri value chain as a part of this study. The focus has been placed on the services based on the need of the farmers such as credit availability, wastage in the production process. Based on these factors, Jai Kisan jai (2020), BharatAgri bha (2020) and Tan90 tan (2020) were chosen. The questions for the startups are composed of two sections covering business-related aspects and farmer/customer-centric aspects. The themes for the questions fell under product or service value understanding, total customers and churn rate, business model and influence of other organisations on the business side. Detailed questions were asked to understand their perception of the customers' lives, value and decisions.

Business related questions

1. Explain to me your product/service?
2. Can the farmer selectively use parts of your product?
3. How do you customize it for each user?
4. How do you communicate your value proposition to the farmer?

5. What is the cost-benefit analysis for the customer (small and big farmers)?
6. Number of customers to date (total), current customer and churn rate.
7. Have you explored both B2C and B2B? What were the pros and cons of each model?
8. Have you collaborated with any organizations like FPOs, NGOs, cooperatives? If so, tell me more about it.

Farmer related questions

1. What are the issues you face in scaling up?
2. What issues do the farmers have with your product?
3. How do you establish trust among farmers?
4. Explain your company's understanding of the farmer's mindset. (Peer pressures, influencers, psychology)
5. How do you choose a village set up operations (parameters)
6. Has the local government helped you in any way?
7. Cost or subscription price of the service
8. Continuity of service by the service provider
9. Cost of switching to other startup's technology

Phone calls have been conducted with employees from all the above-mentioned startups. The objectives of the project were communicated and the questions were shared with these employees and other stakeholders and the data was collected during the subsequent calls. The summaries of these calls are utilized for the purpose of analysis and are presented in this report. Data on the startups has also been collected from the company's website, mobile applications and other online databases.

2.2 Customers

Five customers of each startup have been contacted and interviewed. In the questions for the customers, both general and startup related information were collected. The motive was to understand their lives and the problems they faced with respect to the service and agriculture in general. Emphasis was placed on understanding how they

discovered the service and their decision-making process. The claims of the startups were compared with the actual effects before and after using the product. The points of information for the farmers was focused upon as well.

1. Introduce yourself.
2. Tell me about the app/service/product usage
3. What are the top three problems you face in agriculture?
4. What are the top three problems you face with the app/ service
5. Do you have a smartphone and access to the internet?
6. Tell me about your financial situation
7. How did you hear about the service?
8. How did you do a cost-benefit analysis? How did you make the decision to buy?
9. What was the situation before using the service and after?
10. What are the benefits (compare them with the startup's claims) and problems?
11. Is the local govt. suggesting it?
12. How many in your village use it? Have you referred anyone, why and why not?
13. Machinery and access to credits
14. Do you think some other app or new technology is required/needed?
15. Other interesting insights

During these conversations, a lot more insights about the farmer came up. Questions about the customer service were asked as well. The gap analysis was done by comparing the answers from the customers to the claims of the startups. The report has tried to cover what the farmer's expectations are when trying a new service.

2.3 Output format

The data from the calls has been used to build a model for various stakeholders in a village and how they operate. This could be of some use for startups in the future when they enter a village for operations. The report also compares B2C and B2B models. Both are suited for different kinds of services. Gaining the trust of the farmers is probably the most difficult aspect of an agri-tech startup. This aspect has been covered in the data collection as well. Different strategies have worked for startups.

CHAPTER 3

VALUE CHAIN AND STARTUP PLACEMENT

In this report, we have focused on 3 startups from across the value chain. They fall under agri-consultation, access to credit and cold storage supply chain. I have tried to understand their business model, problems they faced in scaling up the operations and their offerings to the end customer.

3.1 BharatAgri

BharatAgri was founded by two IIT Madras alumni in 2017. The startup provides agri-consultancy services to farmers. Until 2019,, the business was operation oriented with a ground team consisting of agriculture undergraduate students. These students are typically from the regions of operation and make visits to the farms every 10 days. The startup's services covered soil testing, farm geo-mapping to monitor the weather and crop calendars based on the crop grown by the farmer. Farmers had access to the ground team members whenever they faced any issues with respect to their crops. They worked with organisations like Olam in Andhra Pradesh. However, these institutional farmers did not fully utilise the services since the service is paid for by the organisations and not the farmers themselves. The startup also explored B2C sales in these regions, however, the conversion rate was minimal. This B2C exploration has given an impetus for the startup to change course as most farmers were not willing to pay ₹800 for 6 months.

Over the course of 2019, BharatAgri has moved towards an online-first approach with the introduction of their mobile application and started operations across India. This application provides free information about various crops, crop cultivation methods, potential diseases, pest control techniques and weather monitoring while the paid services include soil testing, water testing, crop monitoring and video consultation.

3.1.1 Technology

The agronomy team of scientists collect information on each crop, its nutritional needs, pest and disease control mechanisms and generate an optimal calendar schedule. The farmer's soil is tested and the area is geo-tagged which gives them an accurate measure of the total cropping area and the nutrients available. These conditions are mapped to the most optimal strategy and a custom made calendar is generated for the farmer based on the crop. This is the most scientific way to grow a crop in order to maximise yield.

3.1.2 Claims

1. Save a minimum of ₹10,000 on the crop in costs per acre
2. Increase farm yield by a minimum of ₹25,000 per acre
3. Fewer incidents of pest attacks and crop diseases

3.1.3 Pricing

1. Crop management which includes unique dynamic crop care schedule, nutrient management solution, water management solution and crop protection is priced at ₹600 per acre
2. For every additional crop, a sum of ₹200 per acre is charged
3. For a small scale farmer, who approximately owns between 1-5 acres, this is a costly service
4. For the farmers who own a smartphone to get the application is relatively rich and progressive enough, this isn't a lot of money.
5. The returns for farmers are significant at this pricing level

3.1.4 Investment Stage

The company has seen 4 rounds of funding (3 rounds of seed funding and 1 round of angel investment) with a total funding amount of USD 1.29 million. The investor base includes a total of 9 investors with 4 of them being angel investors such as Aditya Pande, Sachin Oswal, Simi Hari, Ajay Prabhu and the rest being institutional investors such as Uber, India Quotient, AngelList, Better Capital and YES SCALE.

3.1.5 Project Numbers and Operating Regions

The startup has its head office at Pune with operations across Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Madhya Pradesh. They have associated with 20,000 farmers and 46,000 acres across 1400 villages supporting more than a 100 crops. The application has a 4.6 rating with 100,000 downloads on google play store. Around 3,400 people have rated the app.

- With the help of BharatAgri, farmers have produced 30 quintals per acre with an investment of ₹30,000, a significant improvement from the previous produce of 25 quintals per acre for an ₹50,000 investment
- In a region with 500 farmers who bought the service, only around 200 followed the advice provided
- In a B2B project with 1000 farmers, 170 followed the full process and got great results, 450 of them followed the service partly and 350 of them did not follow anything.

3.1.6 Customer Understanding and Mindset

1. In terms of knowledge, the farmers lie across a spectrum
2. Crop variety can be considered as a factor in assessing the progressiveness of a region since cultivating multiple crops requires expertise and knowledge.
3. Farmers tend to prefer free services and are reluctant towards shelling money out of their pocket for services even if the services are efficient.
4. Farmers in rural areas are not very tech-savvy. Only 40% have android phones and digital payment methods aren't widely utilized. This hinders payment and results in poor revenue collection.
5. The effectiveness of the service is correlated to the farmer's willingness to follow the schedule and advice
6. Advice is not well received by most farmers as they pride themselves in knowing better about the profession they've been following for years
7. Insight: Peer pressure is a real problem. If a farmer sees his neighbouring farm use some inputs, they buy it for their farm too. There is an unspoken contention of sorts in adding inputs which has a very bad effect on the crop.
8. Insight: Farmers do not accept the practices or opinions of the progressive farmers in public however they tend copy the practices used by a progressive farmer
9. Prior bad experiences with companies result in farmers staying cautious about any new player in the market
10. Farmers fail to or do not do the cost-benefit analysis

The above reasons along with a bad attitude of the farmers make B2C a very hard operations problem which turns out to be demoralising for the ground staff as well.

3.1.7 Business Model, Pitch, and Trust-Building

- **Explain the science of the service using analogies** Soil test - blood test, nutritional need - food intake
- **Explain the cost-benefit** In this case, the startup has been incurring a loss with an aim to prove to the farmers that the service is effective. This information about the loss helped in conversion.
- **Educational meetings** Conducting educational meetings where farmers can seek solutions for their crop-related problems for free. This would help in gaining the farmers' trust and it would become easier to sell once they value the service as an effective solution
- **Ambassador programmes** the help of best customers since farmers are more willing to listen to a fellow farmer than an outsider
- **Model farm strategy** Demonstrating that the service works by producing more yield in a season with reduced fertilizers is the most effective method. Once you prove to the farmers that the startup's output in the model farm is higher they acknowledge the authority of the startup. However this method leads to significant cash burn in the first season
- Asking farmers to experiment in a small plot helps. They are scared of drastic changes
- It is hard for retailers to sell the service because it's not product-based.

3.1.8 Choosing a Village

The following parameters are looked into while deciding if BharatAgri should enter a village.

1. Cropping pattern
2. Farmer income
3. Farmer mentality
4. It is important to interact with farmers and spend a good amount of time before settling on the village.

3.1.9 Supporting Organizations

(Enough pointers already; write this in paragraphs) FPOs in Maharashtra are very poorly organised and badly structured. The same is the case with Andhra Pradesh. The government claims there are 5000+ FPOs but the agri-based FPOs seem to be much lesser. They do not have an online presence. Most FPOs do not have the contacts of farmers who are a part of it. In government offices, the higher officials are supportive and understand the problem BharatAgri is solving. But the support declines as we go lower in the hierarchy. Ground-level staff are neutral to the service.

3.2 Jai Kisan

Jai Kisan is a Mumbai based fin-tech platform providing loans to farmers in rural India. They provide low-cost financing for agricultural equipment, dairy equipment and other rural yield generational assists and are functional in 9 states. It is founded by Arjun Ahluwalia and Adrienne Maniego who met in 2011 at Texas AM University while pursuing their bachelors of Business Administration. Arjun has half a decade of experience in venture capital and private equity. They started Jai Kisan in Nashik, a village in Maharashtra. Jai Kisan aspires to become an NBFC over time.

The startup provides loans ranging between ₹20,000 and ₹30,000 to small farmers whereas big farmers can borrow in the range of ₹1.5 lakh ₹20 lakh. The lending rate is about 12% (18% - 36% reducing balance) which is very competitive to banks. They cover a range of farming equipment which are usually not financed by banks. The tractor financing is quite competitive but the agricultural implements and infrastructure market is untapped. This is the sweet spot Jai Kisan operates in and makes them the only source of finance for the farmers. They have a B2B2C model where they work with dealers and finance farmers through these dealers. By using the service the dealer is not able to cater to a bigger market. Jai Kisan uses the principle of subvention with the dealers. This profit/revenue-sharing concept is initially not so well received among the dealers. But they eventually realised that they will have an incremental profit by working with Jai Kisan. Jai Kisan also works with manufacturers in a similar revenue-sharing model. They wish to work with the government by playing a part in the subsidy schemes.

3.2.1 Customer Journey

When a customer at the dealer's shop does not have enough money to purchase the equipment, the dealer vets him and sends the details to Jai Kisan. The Jai Kisan team then follows up and sets up a document collection date. Once the documents are received, a CIBIL check is performed. The farmers meeting the Jai Kisan criteria are processed and the loan status is updated. The dealer delivers the equipment and the same is inspected by the Jai Kisan ground team. The loan is later credited into the dealer's or manufacturer's account deducting Jai Kisan's share. Jai Kisan also charges

a nominal processing fee for the same. The loans are then paid back through monthly EMIs by the customer.

3.2.2 Business strategy

Loans are a demand-driven product. It is hard to know if a person needs it unless they give out information on it. This makes customer acquisition hard. Jai Kisan is useful for cash-poor farmers since big farmers usually do their transactions using cash. The profits for Jai Kisan come from two sources, the interest payments and the share from the subvention. Their interest rates are very nominal and are of good value to the farmers. The percentage of revenue shared varies from dealer to dealer and also across products.

3.2.3 Funding

The company has seen 2 rounds of funding (1 round of seed funding and a Grant). The seed funding amounts to $2.06 million while the grant (prize money) funded by Future Food Asia on 21st May 2019 is undisclosed. The investor base of seed round includes 9 institutional investors such as Blume Ventures, SAP, Better Capital, AngelList, Astarc Ventures, Prophetic Ventures, Constellation Blu, Bharat Inclusion Initiative, Village Capital and 4 angel investors such as Harsh Bangla, Sanjaya Mariwala, Harshbeena Zaveri and Aaryaman Vir Shah.

3.2.4 Numbers from previous projects

- They have more than 8000 farmers as customers across 9 states
- They have more than 450 channel partners

3.2.5 Business Model, Pitch and Building Trust

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- Camps are conducted in villages. These are very time taking but they are very profitable. These camps are used to generate customer data.
- We bank on the dealers or institution's trust owing to their rich experience.
- Serving well is the best way to gain trust among the farming community.

3.2.6 Choosing a Village

The following parameters are looked into while deciding if BharatAgri should enter a village.

1. The RBI default rates are looked into. RBI marks some villages as red and those are avoided.
2. A village where cash crops are grown are preferred.
3. Farm equipment penetration is also considered.

3.2.7 Customer understanding and mindset

They have multiple customers. The following are about the farmers.

1. Farmers do not understand finance and the need for it. They fail to do a simple cost-benefit analysis.
2. Most are very short-sighted and do not have long term plans. They live in the now and they try to make ends meet.
3. Government schemes like Kissan Credit Card gave loans up to ₹2 lakh for farm inputs. Most of these loans are usually waived. This has led to a serious mindset problem among farmers where they think loans will be waived by the government. This has affected the lending ecosystem and the market.
4. "Monkeys see, monkeys do" is prevalent among farmers. The same was observed to be true among the dealers as well. Once they see someone in the village profiting from a service they sign up themselves. But they wait till they know for sure.
5. Contacting the *sarpanch* and elderly people in a village helps. Convincing them can help convincing the rest easier.

6. Village shops are a good scourge for information and they help in spreading the information too.
7. Word of mouth works among farmers but Jai Kisan has not been able to crack it yet.
8. Ground-level operations are hard. Reaching out to farmers is tough because of a bad mobile network.
9. The farmers are very fickle-minded. A 90% done deal can go void overnight.
10. They sometimes do not have the required documents, even the very minimal ones.

The following are about the dealers and institutions:

1. Dealers still prefer cash-based transactions and only use Jai Kisan if cash is impossible.
2. Institutional clients are a safer market as the deduction is done at source and the default guarantee is given by the institution.
3. The profitability is quite low and the market is limited. B2C is the end goal.

3.3 Tan90

Tan90 manufactures portable cold storage boxes which help reduce the crop wastage post-harvesting. A minimum of 20% of the crop produced is lost before it's consumed. This prompted a group of PhD students from IIT Madras who were researching on cooling agents to enter into the cold storage supply chain market. The startup manufactures boxes of varying capacity for various use cases. They have their patented cooling thermal panels which maintain subzero temperatures for 8 to 12 hours. These panels can be recharged by freezing them for 5 hours and their temperatures can be controlled. These boxes can be used by individual farmers (Agri, dairy and fishery) and can also be used to convert a non-refrigerated vehicle into a refrigerated one. Rooms can also be converted into a temporary cold storage unit using these boxes.

Tan90 aims to become a logistics network company overtime. They are also working on utilizing solar energy to charge the panel. A mobile application is underway to track the charge available on the cold storage panel in live time using IoT based sensors. The alternatives in the market are ice boxes which are not reusable. Tan90 thermal panels, on the other hand, have a lifetime of 5 years.

Tan90 is one among the few players to enter this fragmented cold storage market. They have found a product-market fit and believe that they have a first-mover advantage. The bigger challenge in the coming months is to figure out the distribution channels. They have raised seed funding of $175,000. The names of the investors is not disclosed yet.

3.3.1 Claims and Pricing

1. Guaranteed reduction in wastage of goods. The percentage depends on the item stored.
2. Reduction in operation costs by 50% as the food can be stored for a longer time.
3. The buyer breaks even on his investment within 5 months.
4. The boxes are priced at ₹6,000 and come with 3 panels.

3.3.2 Project numbers

Tan90 has shipped over 200 units since December 2019. They are working with the Murugappa Group, Govt. of Tamil Nadu. They are also working with an FPO in Andhra Pradesh.

3.3.3 Business strategy and challenges

- Realised selling to farmers (B2C) is a very tedious process with very low conversion rate and moved to a B2B approach. They use the B2B client's network while choosing the village.
- They also face challenges like manufacturing and inventory management which most product-based companies have.

3.3.4 Customer mindset

1. Farmers expect a faster or immediate Turnaround time (TAT) or some sort of cash benefit which makes it harder to sell to them
2. They copy what the rest are doing.
3. They look for subsidies when it comes to buying products.
4. In B2B, trust is built by delivering a good product.

CHAPTER 4

PERSPECTIVE OF THE CUSTOMER

4.1 BharatAgri

To avail BharatAgri's services customers should be able to download a mobile app. This places the first constraint as the need for a smartphone sets the bar high for an average farmer. BharatAgri has in-person operations in some regions of Maharashtra. The ones who have taken the paid subscription are educated, rich and progressive. These people have owned a smartphone for more than five years and are also well versed with online payment methods. However, 90% of the farmers in India are small scale farmers and they do not fall in this bucket. Most rural farmers follow age-old methods of farming. Also, when an outside group advises them about farming, there is resistance.

4.1.1 Before using the service

Most farmers follow the same practices in villages. They usually require assistance with fertilizers and pesticides. When companies release new fertilizers, they send company representatives to spread the information. These representatives help the bigger farmers in-person and educate the shops in the region. Their motivation is to sell more products and therefore, they try to convince the farmer to use their fertilisers and pesticides. But excessive usage of these products can result in the land losing its fertility over time. Over time these stores become the source of information. The fertilizer and pesticides shops often give credit to farmers which puts them in a binding state. The government officials help to some extent in some places but in most places the farmers find the government officials to be of no help.

Progressive farmers have tried using the internet to find more scientific practices and experiment on their farms. The primary sources are Google and YouTube. They have also used apps like Plantix, BigHaat and Naa Panta which are free.

4.1.2 Discovery and Resistance

As mentioned, the farmers who finally discover BharatAgri are typically the progressive and educated ones. They reach the app via various routes such as a google search to play store, directly on play store, online ads to play store and on the similar apps panel on play store while searching for other apps. They usually install multiple apps to check what's available. The resistance starts when they realise most features are paid. The BharatAgri team calls the farmer regarding the same as well.

Most rich farmers feel ₹600 is not a lot of money and sign up for the service. They usually get the service for one acre of a plot to try the service as an experiment. People who are currently dealing with crop issues tend to buy the paid service as well since they are in a desperate position trying to minimise their damage and feel BharatAgri is an affordable solution to try.

4.1.3 After using the service

The app provides a crop calendar and crop assistance. Most users use the app for information on farming methods and inputs. They start growing a new crop with the assistance and information on BharatAgri. The most used service of BharatAgri is crop assistance. The users can chat on the app or contact on WhatsApp. They can call the agronomist as well. The farmers are added to WhatsApp groups where they can post their questions and send pictures of the crop when there is an issue. The ones who followed the service have surely seen a reduction in costs.

4.1.4 Gaps in Application

1. App language is an issue for farmers. The app currently supports English, Hindi, Telugu, Kannada and Marathi. Customers are not aware of how to change the language and the call support is limited to English and Hindi. This is a serious problem when they are providing a pan-India service.

2. The team suggest various fertilisers and pesticides, but BharatAgri is not aware of the availability of these products in the places where the customer lives. The service becomes pointless if the farmer can not follow it. The customers expect BharatAgri to do some research on what is available for them and if they're going to suggest something, it would be great if BharatAgri could deliver the product.

3. The ability to change the calendar date should be made available. Most times what happens in reality varies from what the calendar predicts.
4. The current response time varies between 1-2 days. This should be reduced to less than a day.

4.1.5 Referrals

Most of the users who are using BharatAgri have not referred it to their fellow farmers because they are not sure about the service themselves. They feel the other farmers probably will not listen to them even if they suggest it. Some feel the app is too technical for poor farmers and they do not suggest it. Most farmers do not discuss how they grow their crop among themselves. They sometimes copy what the neighbour does.

4.2 Jai Kisan

Jai Kisan works with implements dealers to give loans. They follow the subvention model, which leads to incremental profits for the dealers working with Jai Kisan.

4.2.1 Before using the service

Prior to Jai Kisan, customers of the dealer had to apply for a bank loan and loans are only available for select equipment and infrastructure. Additionally, these loans are sometimes capped and not everyone is eligible for a bank loan. Banks take about 2-3 months for the loan approval process, however, the loan conversation rate is not high. Although farmers get government subsidies, these subsidies are credited only after the purchase of the equipment. This lack of credit during the purchase process had resulted in a decline in potential sales for the dealers and a delay in work for farmers. All these factors together left farmers at the mercy of banks, local money lenders and sometimes the dealers for credit.

4.2.2 Discovery and Resistance

The discovery first happens when Jai Kisan sets up their office in an area. This gets the people talking about Jai Kisan's services. The most efficient way of improving dealer conversion rate is through referrals, wherein, an existing Jai Kisan dealer is brought in during the call and made to pitch Jai Kisan to a new dealer. This helps the chances of getting the new dealer onboard.

Dealers run a business and their objective is to maximise profits. So when they first hear about the JaiKisan model, they tend to feel a huge amount of resistance as the model involves an additional payment, which was not necessary for running their business the way they did up till now. These dealers prefer to handle their transactions in cash and take quite some time before they decide to sign up with Jai Kisan. It's easier for them to make a decision when a fellow dealer explains them the benefit of Jai Kisan.

The dealer introduces Jai Kisan's services to the farmer when they do not have sufficient funds for a purchase. The farmer is also called up by JaiKisan to explain their

services. Farmers, however, do not have much resistance as they know that this is the only form of credit they can avail and the interest rates are comparable to that of the banks' interest rates.

4.2.3 After using the service

With JaiKisan, the wait time for acquiring credit has seen a significant reduction, down to one week. Dealers input the details of farmers in a mobile application, then the Jai Kisan ground team collects documents and verifies them along with the CIBIL check. The conversation rates are also higher than that of banks. The contract with dealers includes a loss-sharing clause, which comes into effect when a farmer defaults, this makes dealers more diligent when they refer a customer to Jai Kisan.

The loan is disbursed once the farmer receives the equipment, post which the farmers sign a mandate to auto-debit the EMI from their accounts. The dealers also assist farmers in this process by reminding them when they miss their EMI payments. This acts as a foolproof for Jai Kisan. Over time, it has been observed that these dealers have also referred Jai Kisan to their friends in other areas.

4.2.4 Business Impact

1. The numbers of customers increased by 30% and although they do not receive 100% of the profits, over time they see that this incremental market has become available to them.
2. Revenue sharing varies from dealer to dealer
3. The rejection rate is less than 10% which is a direct effect of the due diligence done by the dealer
4. The interest rate varies based on CIBIL and Jai Kisan's internal rating of the farmer and lies between %
5. Till date, no farmer has reported any problem to the dealers

4.2.5 Gaps in the business

1. Total loan amount by Jai Kisan is usually 50% of the project cost which is very less for most projects the farmers avail a loan for. Customers expect at least 75% of the project cost to be covered. Dealers expect that this change can bring in more customers and almost triple the number of customers.

2. The repayment schedule of JaiKisan used to be 1 year but it's between 1 to 3 years now. Even 3 years is a small time frame to expect the farmer to repay the loan. The banks usually give a 7-10 years time frame.

3. Deciding the profit-sharing ratio has proven to be tricky. Currently, the ratio stands at 60:40 (JK : Dealer). However, dealers feel that a 50-50 ratio would be a fair deal.

4. Dealers would like more variety in the manufacturers associated with Jai Kisan.

5. Jai Kisan could have more dealers on the ground to reduce TAT.

4.3 Tan90

Tan90's potential customers are people working in agriculture, horticulture, fisheries and dairy industries. There is a need for cold storage in these industries on a day to day basis. The existing options serve the big farmers better. Tan90 is currently selling to organisations that work closely with the farmers for their betterment. They have sold to a Farmer Producing Organisation (FPO) in Andhra Pradesh and Murugappa Chettiar Research Centre (MCRC), an NGO in Tamil Nadu. MCRC has a network of offices and they have established trust with the farmers in the villages they work in. They work with companies and colleges to take their solutions to villages at lower prices for farmers. They distributed Tan90 boxes to small scale farmers and these farmers cultivate vegetables and sell their produce in the local markets on a daily basis.

4.3.1 Before using the product

Most farmers growing vegetables face food wastage ranging between 20-30 per cent of their produce. The available storage options are in tons and small farmers do not use them. A farmer who takes 20 kgs of vegetables to sell at the market usually ends up wasting 2.5 kgs in 2-3 days.

4.3.2 Discovery and Resistance

Tan90 understood B2C is not the way for them, hence they chose existing institutions and their networks. The farmers heard about Tan90 through a trusted source and there was not any resistance from the farmers as these organisations paid a significant portion of the price of the box. The farmers were more than happy to experiment. Farmers had to move their produce as soon as they harvested. Most times the amount harvested is less than what they can transport. They can not use their transportation resources to the fullest and also lose time on the field as they have to manage the transportation.

4.3.3 After using the product

The losses in produce have seen an 85% reduction, falling from 2.5 kgs (for 20 kgs of vegetable produce) to 150-250 grams. This number varies from crop to crop. However, irrespective of the crop, the reduction has been substantial. These cold storage boxes are most useful in summer. These farmers used to sell their produce for lower costs towards the end of the day to finish the lot. This loss in revenue has been circumvented after using Tan90 because now they can bring back the unsold items in the cold storage box. They mix it with the next day's lot and sell it to realise the full value. This is a complete change in the behaviour of the farmer. Now, farmers can store and transport their lot once in two days thus improving productivity.

4.3.4 Gaps in the product

1. The box is hard to move around with. Using it on the backside of the two-wheeler is hard. It needs a custom stand. Once the box is mounter the vehicle can't be used for other activities.
2. The box is heavy.
3. It is difficult to open the full box every time. A small hole with an hinged lid would make it easier for the customer.

CHAPTER 5

OBSERVATIONS, INFERENCES, AND RESULTS

5.1 Government schemes and subsidies - consequences

Both Maharashtra and Telangana governments have good horticulture schemes in practice which provide subsidies. Maharashtra has two schemes, namely National Horticulture Mission, which provides 50% of the cost of infrastructure and the Pocara scheme, which gives 75% but is only available in 14 districts which are backward. The Telangana schemes are 95% subsidised. Once the work is completed they will have to apply on an online portal and submit the proof of completion. The process takes 2 days and the subsidy money is credited in the farmer's account.

The farmers of Maharashtra are not fully covered by government schemes. This keeps their skin in the game. The climatic conditions of these regions are not very promising too. The summers are so hot that they grow cotton and chilli. This forces them to be more progressive and open to the advice of Agri tech startups. The local governments are not very helpful in terms of technical inputs.

On the other hand, the farmers in Telangana and Andhra Pradesh are fully covered by the government. These governments also provide minimum support when the farmers are out of work. This combined with the subsidies has affected the market and the mindset of the farmers. The farmers expect freebies and subsidies on everything. This makes it harder for startups to expand operations. The governments also actively rewrite the loans taken by the farmers.

5.2 Major Problems Faced by Farmers

In 10 out of the 15 calls made, the farmers indicated that they were most worried about rain and seasonality of the market. The weather is not something they can control. They also mentioned that they faced problems with agri marketing. Most farmers grow the

same crops or grow something that fetched them the highest price the previous year. Often, most people in the village deploy the latter strategy. The effects of this are realised when the village starts harvesting. Due to surplus availability of the crop, the price is driven down.

Farmers definitely can not predict the market 6 months into the future. Farming is a tough profession which involves a serious amount of work and care over long periods of time. The whole process feels questioned when the price of the crops is not realised. They feel the best way to make their lives better is to help them sell what they produce for reasonable prices. One can use scientific practices to increase the yield but it would not matter if the market is unfavourable.

The farmers are not skilled at selling what they produce. They usually sell it to a middle man who drives down the prices to increase his margin. The harvested crops have very small lifetimes. Unless they are sold the whole lot is wasted and this makes the farmer desperate to accept the bad deals he/she is offered. Some farmers try to sell their lot to new vendors. This is taken as an act of defiance by the regular middlemen. If the same farmer fails to find a vendor in the next season the middlemen will not buy the lot from them. The middlemen do this to teach a lesson.

5.3 Need for Agri-Marketing

There is a big supply chain between where the food is produced and where it is consumed. Agri marketing covers a lot of aspects in the process of moving an agricultural product from the farm to the end customer. The end customer can be anyone ranging from a person who buys vegetables in a grocery or a food processing unit. It involves planning, organising, directing and handling the agricultural produce. This is the crucial value generating process which decides what everyone in the supply chain gets. The farmers feel a service which helps them with Agri marketing can solve many of their problems. Farmers would also like a service which predicts the market and suggests to them what to grow each season to optimise their profits.

5.4 Decision Flow for Farmers

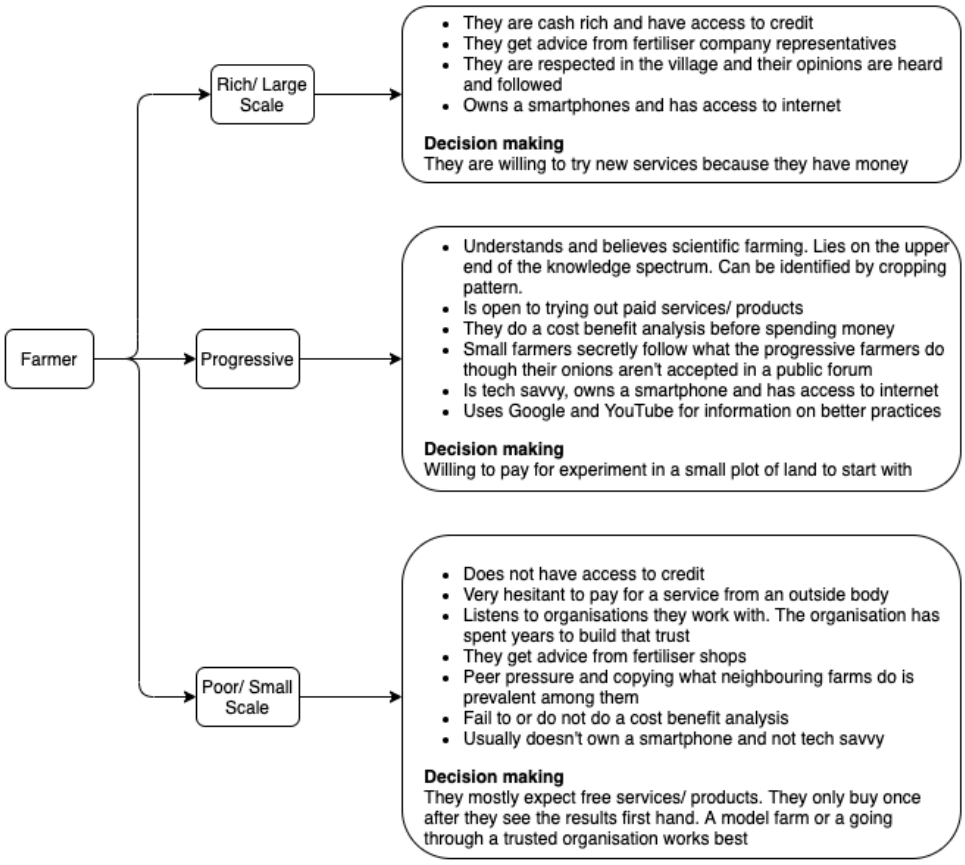

Figure 5.1: Decision Map of a Farmer

5.5 Farmer Mindset

- There is a spectrum among farmers in terms of knowledge. Some are aware of scientific practices.
- They have a sense of pride inherently because they have been in the profession for a long time.
- In many places they have had a bad experience by trusting a company. This has made them think every new company is a potential scam. The startup has to overcome this additional barrier in some regions.
- Most are short sighted and do not have a long term plan. They try to make ends meet. Thus they expect immediate returns on investments they make.
- Governments have waived their loans too many times that they think most loans they take will be waived off.
- They are fickle minded and change their decision over night. They also delay the decision as much as possible.
- They expect subsidies in anything they buy. This should be kept in mind before deciding the price of the service.

5.6 Stakeholders and things to look for while choosing in a Village

Farmers	Fig. 5.1
Fertilizer, Pesticide shops	These are often the source of information for small farmers. They also provide a line of credit which binds the farmer to them.
Village *panchayat* and elders	In most rural areas the elders and *sarpanch* are valued. Their opinions are heard and followed. This can be a good starting point.
Rich farmers	Fig. 5.1
Company Representatives	They have an established network in the region. They are well connected with the large farmers. The farmers believe them though their motive is to sell as much of their product.
Local shops	Apart from the fertilizer shops the rest can be good sources to spread information. Most discussions happen here.
Progressive farmers	Fig. 5.1
Organizations and companies	There are NGO, FPOs and companies which work in rural areas. They have gained the trust of the farmers over years. Startups can work with them in the initial stages.
Agriculture and horticulture offices	The authority of these offices vary from region to region. These officials have good credibility and say in areas where government subsidies and schemes are being properly implemented. There is still a long way to go before they can collaborate with startups. The ground level offices only listen when the order comes from above.
Cropping pattern	This indicates the progressiveness of the region. Cash crops and multi-cropping need technical expertise.

Table 5.1: Stakeholders and things to look for while choosing in a Village

5.7 Gap Analysis

Gaps 2, 3, 4, 6 and 7 are out of the scope of this study as they cover how the gaps come to be within the organization. Data is available for gaps 1, and 5 as they are about the differences from the startups and the customer's opinion. The following are the inferences from the data. We have already covered the gaps between the actual service and expected service. Also in most cases the farmers do not have an expected product in mind.

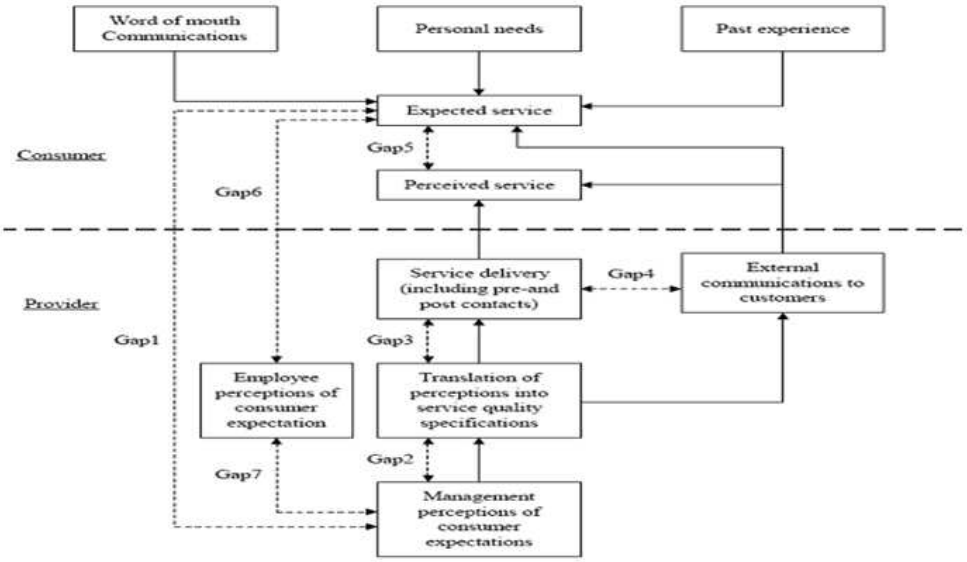

Figure 5.2: Service Quality Model (Gap Analysis) Adopted from Parasuraman, A., Zeithaml, V.A. Berry, L.L.

5.7.1 BharatAgri

Gap 1

The expected product varies based on the type of farmer (small or large). BharatAgri is a single product for a spectrum of farmers. There are bound to be mismatches because the expectations of farmers when they spend money is different for each type. Also with a pan India product they can meet the expectations of everyone as the farmer mindset and type will vary a lot from region to region. They can only provide a core service which is based on science.

Gap 5

The farmers themselves are wrong in what is the best expected solution for them. It is true that they have more experience in terms of years in agriculture. But the startups have an offering which is a relatively new finding or technology. The startup looks out for the best interests of its customer. The same is the case with BharatAgri but the farmers fail to accept this sometimes. Only the progressive and educated ones follow the service properly thus creating a gap between the expected product and perceived product.

5.7.2 Jai Kisan

Gap 1

The expected solution is a customer friendly bank/ company. Though Jai Kisan understands that the market they operate is a high risk one. They can serve the customer better once they become an NBFC themselves. Until then it would be hard for them to fulfil all the expectations of the farmers. Also, most farmers do not have an idea of the expected product because they do not know a lot about finance.

Gap 5

The expected service by the dealer shops is one where they get most of the profits. This is mismatch in the terms and is a part of any business. The farmers are more than satisfied with the terms.

5.7.3 Tan90

Gap 1

The industry by itself has just started to evolve. The cold storage supply chain has a long way to go and it is not considered as the most pressing problem by most farmers but there is definitely a need for the service. The ones who have used the product realise that by taking the extra effort they can earn a little more. There is a variety of goods and each one has a specif need in terms of product dimensions. The cooling facility might not be available everywhere. Tan90 boxes take the assumption that the end customer has the ability to move the box around. They still have to work on making side fittings to ensure that the box can be used easily on any vehicle.

Gap 5

Tan90 acknowledges that their product has a long way to go and there are various possibilities with the cooling panels they have. It is still early to talk about this gap.

CHAPTER 6

CONCLUSION

Agriculture has been the backbone of India. We have seen the green and white revolution change the agricultural landscape by making India self sufficient. There haven't been any major changes for a long time now. Most developed countries have incorporated modern practices in agriculture. India is still behind in terms of the output per unit area. With the increasing smartphone and internet penetration, information is available much more readily for the people who are willing to look for it.

There are a lot of inefficiencies across the agricultural supply chain and most people are aware of the middleman problem. These gaps gave space for startups to find solutions across the value chain. Whilst doing so, they faced a lot of challenges and some of them have been covered in this report. For a startup to effectively serve their customer it's important to understand the customer and the environment they live in. A lot of assumptions and hypothesis made by startups typically end up being inaccurate.

There is a knowledge spectrum among farmers. There are various types of farmers and how each makes a decision is different. This report has tried to make models of major types of farmers. The rural environment also plays an important role in the decision making process. Small scale farmers live to make ends meet and their mindset is a result of the same.

For startups to work effectively in a village or with a farmer, they will first have to establish trust which is a time taking process. The startups are burning cash and resources at every instant. B2B seems like a better entry point into a village than B2C. The startup can move to B2C overtime while gaining the trust of farmers. It is also important to be diligent about where a startup sets up operations. Various parameter have been discussed in this report on the same. Having a local office helps build credibility.

In the age of technology, it is about time that the rural India starts incorporating scientific methods. The next big revolution in agriculture will be a result of fusing technology into the supply chain. The startups still have a long way to go in decoding

this market. There are various avenues to create an impact on a farmer's life and make a sustainable business in the process. A. Parasuraman *et al.* (1985) bha (2020) G. Umang and Gautami (2019)

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