

Manufacturing Manure from Collected Waste Food & Delivering it to Farmers in Need

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Abstract: This paper is concerning the impact of exercise of room wastes and cost-efficient farming practices. Throughout this paper we'll be discussing intimately concerning the problems baby-faced by restaurants handling large quantity of food wastage and small-scale farmers unable to buy for fertilizers because of its high tag. These a pair of sectors are usually helped by assortment of waste from restaurants and tiny hotels and composting it and merchandising to farmers throughout an affordable worth. In this method each the restaurants and farmers are happy. All this might be done by our company Agricle which might be explained throughout this paper.

1. INTRODUCTION

The utilization of chemical fertilizers and organic manure has each positive and negative effects on plant growth and so the soil. Chemical fertilizers are comparatively high-priced, have high nutrient contents and chop-chop haunted by plants. However, the utilization of excess fertilizer might finish in kind of issues, like nutrient loss, surface water and groundwater contamination, soil natural process or basification, reductions in helpful microbic communities, and redoubled sensitivity to harmful insects (Chen 2006).

Organic manure features kind of shortcomings, as well as low nutrient content, slow decomposition, and different nutrient compositions wishing on its organic materials, compared to chemical fertilizers. However, organic manure has multiple edges due to the balanced provide of nutrients, as well as micronutrients, redoubled soil nutrient convenience due to redoubled soil microbial activity, the decomposition of harmful components, soil structure enhancements and root development, and redoubled soil water convenience. In agricultural fields, organic manure that is made from animal by product has been utilized to beat environmental contamination and plant productivity reductions that result from the constant utilization of chemical fertilizers. Exercising waste from the stock industry prevents environmental contamination and reduces treatment prices. At a similar time, it promotes soil enhancements and agricultural productivity. However, the coincident use of chemical plant food and organic manure has disclosed numerous results relative to the plant types and soil characteristics. Chand et. al. has reportable that the mixed use of nitrogen- phosphorus- potassium (NPK) chemical plant food and stock organic manure will increase the mean growth of mint (*Mentha arvensis*) and mustard (*Brassica juncea*) by forty sixth and so the soil concentrations of N, phosphorus, and atomic number 19 by twelve months, 129%, and 65%, respectively. Kaur et. al. compared the utilization of chemical plant food treatment solely and mixed chemical plant food and organic manure treatment in farmland rotating sorghum (*Pennisetum glaucum*) and wheat (*Triticum aestivum*), and placed that organic manure increased the soil concentrations of organic carbon, nitrogen, phosphorus, and atomic number 19, thus lightness its importance in tropical farmland, that lacks organic matter. A study on tomatoes (*Lycopersicon esculentum*) and corn (*Zea mays*) in acidic soil by Murmu et. al. found that organic manure will increase crop productivity, N utilization potency, and soil health compared to chemical plant food.

Most studies in agricultural fields have reportable that organic manure decreases the harm which might be induced by chemical fertilizers and improves crop productivity. With these benefits and disadvantages of organic manure, and the disadvantages of fertilizers in mind, our company has set to help farmers get a much better yield by providing them with quality organic manure at their threshold.

The entire Municipal Solid Waste (MSW) generated in urban Asian country is calculable to be 68.8 million tons once a year or 188,500 tons per day. This infrastructure offered inside the country is insufficient for the economical handling and disposal of this large amount of waste on daily to day basis. Collected waste is usually drop in open land or used for landfilling. This results in severe environmental hazards. Due to the inadequacy of land, existing marketing yards are generally overfilled. Though burning is more and more getting used for waste disposal, it cannot be advocated wide due to the associated unhealthful gas emissions. Associate in nursing analysis of solid waste inside the most cities of Asian

country disclosed that ~51% of it consists of degradable organic material. Though this organic waste cannot be used as fuel because of its high wetness and low hot worth, the plant nutrient content makes it ideal for exercise as manure for crop production.

The conversion of solid waste to organic material might even be a fascinating choice, in light weight of reports that severe depletion of soil organic matter might even be a heavy rationalization for declining crop productivity. The utilization of organic fertilizers not solely reduces the quantity of the organic fraction that finishes up in landfills, but also reduces the utilization of inorganic fertilizers. Aerobic and anaerobic composting practices are widespread inside the country; however, they are slow processes, limiting the employee turnover of waste exercise and disposal. Waste possesses to be collected from sources and transported to the composting yards, and largescale dumping close to the units for long periods leads to severe environmental pollution.

To boot, improper separation of the inert materials, like plastics and glass, might degrade the standard of the last word compost for agricultural functions. Throughout this context, a fast methodology for the conversion of source segregated waste to organic can facilitate to beat these issues. With these things thought of, Agricle are aiming to be victimization the food and organic waste collected from restaurants daily before they are drop & use them as raw materials for the manure. This way we'll be utilizing the organic waste with efficiency whereas additionally finishing the foremost product that's required for our business.

2. MATERIALS AND METHODS

Materials

Raw Materials

The raw materials are going to be the wasted food and every one the vegetable and alternative ingredient waste collected from restaurants and hotels and therefore the near homes.

Actinomycetes

The Actinomycetes are literally bacterium however in most publications ar mentioned one by one as they play a significant role within the decomposition the less simply degraded than that favoured by alternative bacteria. Actinomycetes may also tolerate drier conditions than alternative bacterium and turn out a chemical (geosmin) accountable for the typical musty, earthy smell of compost. They are unremarkably found in compost 5-7 days when the begin of the method. The Mesophilic actinomycetes operate best in medium temperature areas (20^o-50^oC) of the compost unremarkably the sides of the heap or bin and at the tip of the method. Thermophilic eubacterium grow at between 30^o-60^oC. The optimum temperature for thermophilic fungi is 40-50^oC that is additionally the optimum temperature for polymer degradation in compost. Like fungi, Actinomycetes kind threads, filaments, or strands, that unfold throughout a compost heap or soil. When bacterium, Actinomycetes are the second most well-endowed organism within the heap. There are generally a 100,000 -100 million in an exceedingly gram of compost. They are doing not respond well to acidic conditions (below hydrogen ion concentration five.5) or within the presence of a high wetness conditions.

Fungi

Fungi conjointly kind filamentous filaments apprehend as hyphae, that unfold through the heap or bin. Fungi play a vital role, as they're able to breakdown the a lot of resistant organic material e.g. polysaccharide and polymer. Plant life hyphae aid the aeration and drain of the compost pile by physically aggregating into tiny particles. There ar between ten, 000 - 1,000,000, plant life cells per gram of compost. several plant life hyphae are comparatively simply seen by the optic being larger than those of actinomycetes Most fungi cannot survive thermophilic stage of hot composting as they are doing not grow higher than 50^oC and though there are some heat tolerant thermophilic fungi, so some begin to grow at 60^oC e.g. *Chaetomium thermophile*, some *Humicola* species *Thermoascus aurantiacus* and have a job in mouldering cellulose and hemicelluloses. *Aspergillus fumigatus* may also be active at these temperatures and can still operate once the compost is re-occupied by mesophilic organisms.

Aerobic bacterium

Aerobic bacterium are the foremost vital to the method of changing organic waste to compost. They're necessary for the conversion of the organic material into the damp, made compost we have a tendency to be trying to provide. These aerobic bacteria need O levels of over five-hitter to oxidize carbon to supply them with energy. This reaction method produces the

warmth that raises the temperature of the heap, or bin, throughout the first stages of the composting method. As represented, in the section on hot composting, below the correct conditions the compost can heat up at intervals daily or 2 to 60°C or higher, because of the aerobic bacterium intense without delay analysable material. In addition to carbon. Element is additionally necessary to the composting method enabling the bacterium to make the supermolecule necessary for them to grow and reproduce. Therefore, the importance of the C: N ratio. If the O level falls below 5 % microorganism activity can slow down and the decomposition rate are often reduced by the maximum amount as ninetieth wherever there's poor O gift to support the expansion of aerobic microorganisms i.e. below anaerobic conditions, anaerobic bacterium can ferment the organic material. Sadly, for the composter, the anaerobic method leads to the assembly of organic acids and amines, manufacturing the simply recognizable smell of ammonia, similarly as element chemical compound (rotten eggs' smell). The organic material is changed into a wet, foetid black mess. In practice, if this happens it's as a result of we've got the C:N quantitative relation wrong. We will try and rectify the scenario by adding further carbon made (Brown) material and turning the compost to open the combination to form conditions below that aerobic bacterium will operate. the necessity for a damp combines throughout the composting method, five hundredth - hr wetness content, is as a result of the Compost microorganisms sleep in the water films close the particles of organic matter.

2.1 Diversity of microbial populations according to respective composting stages.

Compost Stage, Group, Genus, and Microbial Species

Mesophilic:

BACTERIA:

Amycolicococcus - Amycolicococcus subflavus

Bacilli - Bacilli badius, Bacilli genus Cereus, Bacilli flexus, Bacillus, Bacillus

polymyxa, Bacilli pumilus, Bacilli spp.

Brevibacillus - Brevibacillus brevis

Enterobacter - Enterobacter sakazakii

Moneran - moneran pneumoniae

Microorganism - microorganism xenopi, microorganism thermoresistibile

Genus - Serratia marcescens

Staphylococci - staphylococci aureus, staphylococci sciuri, staphylococci xyloseus,

staph sp.

FUNGI:

Aspergillus[fungus genus] - Aspergillus flavus, genus niger

Fusarium - Fusarium moniliforme, Fusarium oxysporum, Fusarium sp

Eubacterium - eubacterium antibioticus, eubacterium cinnaborinus, eubacterium griseus,

eubacterium roseus

Mould - Rhizopus nigricans

Plants genus[fungus genus] - fungus genus citrinum

Thermophilic:**BACTERIA:**

Acidorax - Acidovorax sp.

Amycolicococcus - Amycolicococcus subflavus

Anoxybacillus - Anoxybacillus flavithermus

Bacilli - Bacilli benzoovorans, Bacilli coagulans, Bacilli flexus, Bacilli megaterium,

Bacilli nealsonii, Bacilli pumilus, Bacilli stearothermophilus, Bacillus, Bacillus sp.

Brevibacillus - Brevibacillus brevis

Microorganism - microorganism acidurici, microorganism thermocellum, moneron sp.

Comamonas - Comamonas kerstersii

Gemmatimonas - Gemmatimonas aurantiaca

Geobacillus - Geobacillus sp. WCH70, Geobacillus sp. Y4.1MC1, Geobacillus thermodenitrificans

Microorganism - microorganism thermoresistibile, microorganism xenopi

Paenibacillus - Paenibacillus mucilaginosus, Paenibacillus sp. JDR-2

Microorganism genus|bacteria genus} - Pseudomonas mendocina, Pseudomonas putida, Pseudomonas sp.

Rhodothermus - Rhodothermus marinus

Solibacillus - Solibacillus silvestris

Sorangium - Sorangium cellulosum

Sphaerobacter - Sphaerobacter thermophilus

Streptosporangium - Streptosporangium roseum

FUNGI:

Genus - plant, genus fumigates emu. elpticus

Talaromyces - Talaromyces thermophilus, Talaromyces sp.

Thermocyces - Thermomyces sp.

Thermatinomyces - Thermactinomyces sp.

Thermo - Thermo dichotomicus, Thermo vulgaris, Thermo sp

Cooling or maturation Bacteria:

Amycolicococcus - Amycolicococcus subflavus

Bacilli - Bacilli circulans, Bacilli composteris, Bacilli southcampusis, Bacillus

licheniformis, Bacillus, Bacilli pumilus

Microorganism - microorganism xenopi, microorganism thermoresistibile

2.2 Methods

Initial Interaction

Before beginning the business plan, we have a tendency to in person interacted with each farmer likewise as restaurants to {understand|to grasp} and understand what's happening and what problems they're facing 1st hand and what precisely would facilitate them. we have a tendency to created survey forms with explicit queries and therefore the important results are shown ahead.

Raw Materials

First is collection the food wastes from country aspect restaurants. The food wastes from restaurants area unit additional and may be used for one thing smart to create out from it, while not whole wasting it. Its conjointly a and to the edifice employees, because the food wastes occupies a great deal of area. Then, collection the organic wastes from home. This conjointly provides to be a decent resolution for the assembly of biomass. Manure process Next is process them to create quality manure. This helps farmers to save lots of the land area that they'd use to store manure since we're doing the process. And this will be used rather than chemical fertilizers. Selling it to farmers at reasonable price.

Main steps required: -

Composting organisms need four conditions to form compost: -

1. Carbon that comes from brown organic matter like dried leaves, sawdust, paper.
2. Chemical element that comes from fruit and vegetable waste, dregs.
3. Chemical element that comes from air.
4. Water within the right amounts.

With all of these conditions consummated there'll be special closed greenhouse like areas with several compost pits with in chains water spreading system which can provide water to the compost at regular intervals. Here all the raw materials are going to be processed. Each space is going to be selected for a distinct quite manure with a specific nutrient composition demand requested by farmers themselves. The processed manure can then be packed in paper packs and keep within the optimum conditions for delivery.

Key parameters for organic composting and the recommended range: -

Parameter	Acceptable Range	Preferred Range
Carbon to nitrogen (C:N) ratio	20:1 or 40:1	25:1 or 30:1
Moisture Content	40 to 65%	50 to 60%
Oxygen concentrations	≥5%	5%
Particle size (Diameter in inches)	1/8 to 1/2	1/6 to 1/5
Varying pH value	5.5 to 9.0	6.5 to 8.0
Temperature (°C)	43 to 65	54 to 60

2.3 Reaching Out to customers

The manure that the corporate has factory-made has got to reach bent the purchasers. The process by that we'll be delivering product to the purchasers are going to be, wherever we have a tendency to reach bent the farmers with manure.

We have a tendency to come through this by the transport that carries the prepared/manufactured manure for the farmers. The manure is sold-out at low price and conjointly looking on the necessity of manure for the farmers. There'll be daily delivery of manure through the transport for farmers, so they don't ought to store manure and save land-space. For the payment of the manure provide, the farmers can pay offline at a hard and fast date monthly.

The date is going to be fastened by the farmers themselves. The retailers who deliver the manure can have an inventory with the farmers' names sorted out consistent with their monthly payment dates and that they can collect the money whereas they deliver the manure on a daily basis.

After every season the corporate officers can in person move with the farmers and customers for feedback regarding our services and therefore the profits they need gained also will be recorded.

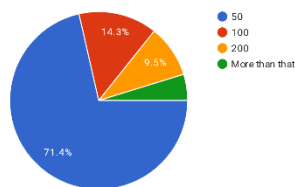
3. RESULTS AND DISCUSSION

The survey that was conducted gave astounding results: -

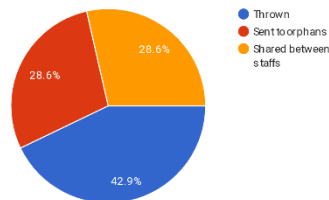
1) Restaurants' Survey.

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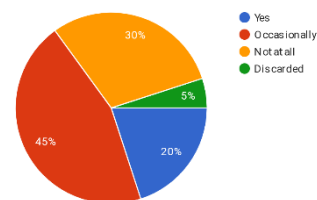
1. How many boxes of food is being wasted daily?
21 responses



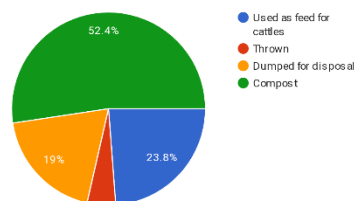
3. Fate of excess food?
21 responses



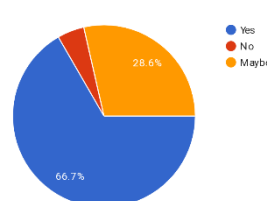
4. Is the previous day cooked food used again?
20 responses



8. Fate of rotten vegetables and fruits.
21 responses



10. If the waste food used for a good purpose, will you be interested?
21 responses



These statistics clearly show that a lot of food is wasted.

At least 50 boxes of food are wasted daily in all restaurants we surveyed. Out of them 0.5% of restaurants even had 200 boxes of wasted food daily.

The fate of the excess food is being dumped in 42.9% of those restaurants while the others either share it between the staff or send the food to places like poor orphanages.

40% of the restaurants said that they discard the food left from the previous day. Only 20% of them put it to use again while some do that occasionally but not always. 30% of them don't use it the next day but don't discard it.

If the rotten vegetables and fruits are considered 52.4% of restaurants make a compost out of it. 19% of the restaurants properly dispose it off separately. Rest of the restaurants either feed them to cattle or openly throw them.

When the restaurants were asked if they would be interested in donating the waste food for putting it to use for a better purpose rather than simply getting dumped 66.7% of the restaurants clearly agreed to it. 28.6% of the restaurants were doubtful and needed more proof that it really will be used for a good purpose. Only 4.7% of the restaurants didn't agree to the idea.

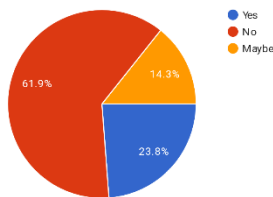
This survey clearly shows that a lot of food and organic material is being simply dumped and wasted on a daily basis. So, this food and organic material can be used as raw material for manure production. Such a large amount of raw material

can be made into a lot of manure. And the responses clearly show that most of the restaurants are ready to donate the waste food and organic material to our company so that we can use them as raw material for manure production.

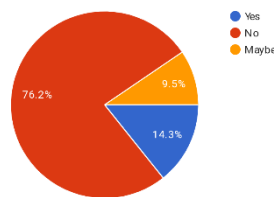
2) Farmers' Survey.

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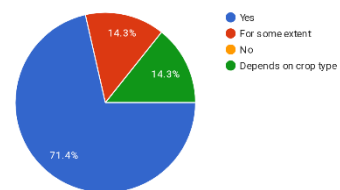
1. Is the income sufficient for daily life?
21 responses



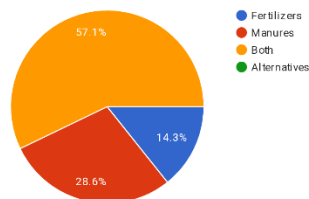
3. Is the fertilizer price is affordable?
21 responses



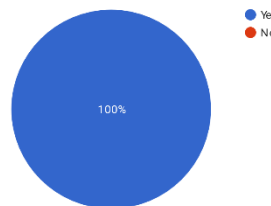
4. Is farming without pesticide and other chemicals possible?
21 responses



6. Which is preferred, fertilizers or manures?
21 responses



10. If quality manure was supplied everyday at prices cheaper than fertilizers, would you be interested in it?
21 responses



These statistics have been obtained from the survey conducted by us with some farmers.

When the farmers were asked if the income they get is sufficient for their daily lives and all their needs, only 23.8% of them replied that it is enough. But it was only enough for their needs and they don't get any extra privileges. Some of them were unsure since it was sometimes sufficient and sometimes not which kept changing frequently. As much as 61.9% of farmers were clear with their response that it is usually never sufficient.

When they were asked if fertilizers were affordable to them 76.2% of them clearly said it's not affordable for them. Only 14.3% said that it is affordable but even they claimed it was only barely affordable for them.

71.4% of the farmers believe that efficiently farming without chemical fertilizers and pesticides is possible. An equal number of them believe that it might be possible while not being sure and that it depends on the crop type. None of them outright refused the possibility of it.

When asked their personal belief of which should be preferred or which would be better 28.6% of them said that manure would be better while 14.3% said that fertilizers would be better. But 57.1% of them said that both will be good.

When the farmers were asked if they would buy quality manure supplied to them instead of buying fertilizers every single one of them agreed to it. They were all ready to go along with it.

This whole interpretation of the survey shows that farmers really have been suffering a lot financially and the expensive prices of fertilizers that they are forced to buy are a very big part of their financial suffering. The personal preferences of the farmers show that most of them are fine with either one of them but they are forced to buy fertilizers due to the time and area they have to invest for manure composting and the manure they simply produce cannot all be used. With all these issues all farmers really needed an alternative which was of good quality as well as less expensive. So, all the farmers agreed to the idea of buying processed high-quality manure at low prices.

The analysis of both the surveys clearly shows that both the food industry and the farmers really need a solution for both the problems. So, the business of our company will be very profitable with the idea being used here. While being profitable it will also help in reducing 2 of the biggest problems faced by 2 industries to a good extent.

BUSINESS MODEL CANVAS

Business Model Canvas

Company Name:
AGRICLE

Date:
28th July, 2020

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
Venture Capitalists Restaurants	The food wasted in the restaurants & homes will be collected by collection vans. The wasted food will be used to make composts for manure production that will be available to farmers for a low cost. Manure storage will be taken care of by the company.	Manure will be easily available at the doorstep daily freeing farmers of all manure production & storage issues. Food will not go waste & will be used for a good & productive purpose	Personal registration for manure delivery amount Personal Feedbacks 24x7 Available Call Center	Farmers Restaurants with vegetable gardens Gardening enthusiasts
	Key Resources Land Restaurants		Channels Advertising Referrals Personal Surveys Recommendations	
Cost Structure Land Transport Vans Advertisements Labour Storage Equipment Packaging		Revenues Streams Manure Payments Venture Capitalists' Investments		

1) Key Partners

These are the ones who support us financially to gain profits from our company’s profits or the ones who act as our suppliers: -

- a) Venture Capitalists – These are other companies & fundraisers who invest in our business project & earn shares of our company’s profits.
- b) Restaurants – These are the main suppliers in our business. They supply the wasted food which is the main requirement for manure production.

2) Key Activities

These are the activities that our company will perform for the satisfaction of the needs of the customers.

Our company will collect the food that is wasted in all the restaurants in the particular district using transport vans.

All this waste will be used to make a compost to produce manure in a piece of land. Organic nutrient supplements like egg shells etc. will be added to enhance the nutrient quality of the manure according to the farmers’ requirements.

This manure will be packed & delivered daily to the farmers according to their individual requirement.

Manure will also be stored by the company using proper storage equipment to prevent farmers from unnecessarily investing in manure storage.

3) Key Resources

These are the resources the company is going to need for the business to function: -

- a) Land – This is the most needed resource. A company providing services always needs a certain area of land to put up an office & workshop.
- b) Restaurants – For the service that our company is providing, the restaurants are very essential resources, since the whole business revolves around the food that is wasted in the restaurants.

4) Value Proposition

A value proposition is the uniqueness in the service/product that is satisfying the customers' needs: -

- a) Farmers face a really big issue of producing & storing manure due to the amount of time, money & land that is utilized in it. Also, fertilizers are also very expensive for them. So, our company does the job for them by producing & storing manure at our workshop & deliver the amount of manure they need daily at their doorstep.
- b) Restaurants in countryside districts face a major problem of managing wasted food. They usually simply throw it with trash. Our company collects this waste food & puts it to good use by using it to produce manure for farmers.

5) Customer Segments

These are the groups of people that we target as the customers who will avail our services: -

- a) Farmers – Farmers make up about 90% of the target audience for this service. Farmers face the problem of buying costly fertilizers which financially dries them up & when they opt for manure, they use up a considerable amount of time & land in its production & storage. So, our company will take that tedious process into its own hands & save the farmers their time, money & land by providing our services.
- b) Restaurants with Vegetable Gardens – A lot of restaurants have their own vegetable gardens & face issues when trying to produce & store manure. Such restaurants can avail our services at a cheap price.
- c) Gardening Enthusiasts – A lot of people love to grow their own gardens in their backyards at their homes. Such people don't need to go through all the mess that happens while handling manure. They can buy manure in small amounts at a cheap price.

6) Customer Relationships

This is the basis through which we build relations with each of the customers: -

- a) Personal Registration – We will personally go & register the interested farmers for our services.
- b) Personal Feedback – Our staff will take a regular monthly door to door feedback of our services from our customers to ensure that they are satisfied & pleased with our services.
- c) 24x7 Available Call Centre - Our staff will be available 24x7 at our call center for any queries from the customers.

7) Channels

These are the mediums through which we reach out to different customer segments: -

- a) Transport Vans - Our produced manure will be delivered to our customers' doors personally through transport vans.
- b) Advertising – The company's services will be advertised using posters & newspapers.
- c) Referrals – The venture capitalists & sponsors will act as referrals for advertising our services.
- d) Personal Surveys – Our staff will regularly conduct door to door surveys to know our customers' changing preferences.

e) Recommendations – Our company can also be advertised through personal recommendations by regular customers. This way our services can reach a wider customer segment.

8) Cost Structure

These are the key elements where our company has to invest: -

- a) Land
- b) Transport Vans
- c) Advertisements
- d) Labor
- e) Storage
- f) Equipment
- g) Packaging

These elements are the most important requirements for even the most basic business ideas to gain success. Investing in these is a must for any business organization. Our workshop will need all of these elements for providing proper satisfactory service to all our customers so this segment lists these elements that the company has to invest in.

9) Revenue Streams

These are the means by which the company will earn revenues for their services. Revenues are earned from various sources. Our company earns its revenues from: -

- a) Customer Payments
- b) Venture Capitalists' Investments

These revenue sources help the company earn profits while compensating for all the places where the company has invested.

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