

# Mobile Vegetable and Fruit Vending Cart



**DEP702**

**DESIGN PROJECT -2**

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**Mobility and Vehicle**

## **Declaration**

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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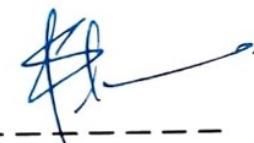
## Approval Sheet

This Mobility and Vehicle design project report entitled "Mobile Vegetable and Fruit Vending Cart " by Praveen Kumar is approved in partial fulfillment of the requirement for Master of Design degree in Mobility and Vehicle Design.

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## 1. Introduction



Fig. 1.1a Vendors in India

According to a study, about 81% of the Indian workforce is in the informal sector, 6.5% is in the formal sector, and about 0.8% is in the household sector. There are around 50 lakh street vendors in India, of which Uttar Pradesh has the most (8.5 lakh). Uttar Pradesh is also in the category of states with large populations of street vendors. Other states with a high number of street vendors include Maharashtra ,Telangana (5 lakh) while Gujarat and Tamil Nadu have (3.5 lakh) of labor. (TribuneIndia 2022)

The number of jobs in India is decreasing, which means there are more informal (unregulated) sectors where people work. This can cause many problems because it doesn't always provide the same benefits and protections as regular, formal jobs. A study has found that the informal sector is the main source of job growth in India, and it needs to be considered when planning for the future.

\*image source - <https://www.istockphoto.com/photo/vegetable-vendor-with-his-cart-in-street-jodhpur-rajasthan-india-gm599969658-103090789>

## Vegetable & fruit vending in India



Fig. 1.1.b Problems faced by vendors

- Street Vending is a frequent occurrence on the streets of India(Fig.1.1b)
- Informal sector of street vending is attributed to the
  - low level of income
  - easy to enter the profession
  - Self -employment
- Vendors on the streets are increasing day by day regardless of the Rain,cold and heat.

\*image source - <https://www.alamy.com/>

<https://www.hindustantimes.com/gurgaon/gurgaon-commuters-blame-fruit-vendors-for-congestion-on-sector-56-road/story-Czx5I6Ex6QNst1OGIdBBnJ.html>

<https://www.dreamstime.com/photos-images/vegetable-vendor-india.html>

## Reasons to take up street vending (Fig.1.2): -

- Ancestral Job
- Difficulty in finding salaried job
- Ease of entry into Business
- Low initial investment
- Flexible in Working
- For survival
- Loss of agriculture



Fig. 1.2 Reasons for street vending

\*Image source - <https://photosbyravi.com/>  
<https://www.istockphoto.com/photo/local-vegetable-market-in-india-gm491960200-76050291>

## 2. Research

The primary research was initiated with questionnaires to know how they were inspired to do the vegetable business .The main aim of the research was to gauge the problems they go through in their daily life with the vending setup. To dive more into the issues a few sets of questions were prepared for the personal interview .

### 2.2 Questions were asked like :

1. Name of the Venders
2. Age groups
3. Gender a) Male b) Female c) others
4. Type of sale a) Vegetables b) Fruits
5. Type of installation. a) moving b) fixed c) others
6. Area required for the Business (Square metres)
7. How long they are in this Business
8. Why did they choose that location
9. How long they located in that site
10. Do they have any Disability, If any then what kind of a) vision/hearing b) Mobility c)Cognitive d)Multiple
11. Do they have any permissions / authorization to work in that area
12. Beside that site do they have any other site
13. What days do they sell
14. What are timings for a)Morning b)Evening
15. Initial cost for installation
16. Do they receive any Governmental Subsidy
17. Who is owner of Cart

18. How much do they invest in average in the purchase of Grocery Value
19. How often do they buy grocery items
20. From whom and where they buy grocery items
21. How much do they sell on average daily
22. Where they do they store their Grocery items
23. How do they handle leftovers
24. How much is their average profit
25. What mode of payment they prefer
26. Would they agree that their business has improved their income , if not then REASON if any?
27. Problems they are facing regarding
  - a)Space e)Parking i)Ergonomics
  - b)Seasonal f)Packaging of cart j)Hygiene
  - c)Rain g)Cleaning grocery items k)packing of grocery items
  - d)Shed h)Site l)maintaining freshness
28. How do they manage with the cart packaging
29. How do they manage electricity for night market convenience
30. Do they sanitize hands Regularly
31. What amount of water they need to clean Grocery items (Vegetables & Fruits)
32. Do they left their Cart at site when leave for home
33. How COVID has affected their Business
34. In what frequency do they sell grocery
35. How do they tackle Municipal Corporation when they come to lift their stalls
36. What all are their expectation with new concept

## User -1

Name-Zaheer Mohammad

Age-29

Height-5ft 6"

Marital Status-Married

Hometown -Badaun (Uttar Pradesh)

Income- 25k-27k

Zaheer Mohammad is a fruit seller in Powai,MUMBAI (Fig.2.3.a) , he came from his hometown Badaun 13 years ago in search of occupation. Zaheer worked in a detergent company, but not getting paid enough with hours were long and uncompromised. He left the job and decided to work as a Vegetable vendor, as the time flexibility of working hours are convenient for him and also, he is able to earn more than the previous profession.

He wakes up daily at 6 AM and reaches the Powai streets by 7Am and sells fruits till 11AM then returns home, then he starts the afternoon day by selling fruits from 3Pm till 10PM at night. And spend his two days of the week in buying fruits from APMC market and carry them to store at his place through public goods services. Zaheer is a hard-working person but sometimes feels bound with the drawbacks of his vegetable cart.



Fig. 2.3.a (User -1)

## Problems

- Have to rush when BMC Peoples are there
- Sometimes it is harder to pull/push cart on Uphill and Downhill Road
- Sometimes have to pay for the parking space also
- Loading and unloading the Cart is bit Tiring task
- It takes a lot time to Load and arrange all fruits on the cart
- NO protection from rain, Direct Sunlight and other seasonal issues.
- Have problems in night with low light
- Have to manage sitting somehow
- Want to incorporate more items on cart but don't have enough space
- Have to pay Regular transport services to carry Fruits to his place
- Have to wait a long for customers
- When need to go for lunch, there is no security of items and carts.

## User -2

Name-Rajendra Gupta

Age-32 years

Height-5ft 7"

Marital Status-Married

Hometown -Prayagraj (Uttar Pradesh)

Income-30k-35k



Fig. 2.3.b (User-2)

Rajendra Gupta used to sell Vegetables and fruits in Hiranandani, Powai (Fig.2.3.b) from the past 9 years, Before Hiranandani he used to sell vegetables in Borivali. Now he sells vegetables in Hiranandani only as people over there don't argue over the prices of groceries which used to happen in Borivali frequently.

His daily routine starts with waking up at 5:30 AM and going to buy groceries from the APMC market wholesalers. He himself along with his brother used to buy and transport groceries to their place on his vehicle only. Then after buying groceries, they have to load and arrange groceries in their vehicle and then move to the marketplace at 7:30AM and sell the groceries till 10:30PM.

Rajendra is planning to further upgrade his cart so that he can get more profit from his business .

## Problems

- Packaging issues for grocery items
- Have to pay for the parking daily
- It takes lot of time to pack and go home
- Loading and unloading the Cart is bit Tiring task
- Arranging all grocery items on cart is time taking
- Have to left cart at site only ,because of too many items
- Have problems in night with low light
- Have invested in cart but not fully satisfied with the design
- Needs extra effort to sprinkle water on Grocery items
- Have to manage with tarpaulin to provide extra roof to the vehicle
- Ergonomically problems in getting in and out of the Cargo space
- Vehicle is not balanced when moving with load.

## User -3

Name-Suraj Rakesh Vaish

Age-24 years

Height-5ft 6"

Marital Status-Unmarried

Hometown -Pratapgarh (Uttar Pradesh)

Income-20k-25k



Fig.2.3.c (User-3)

Suraj's family came to Mumbai in search of employment (Fig.2.3.c). His father started a vegetable business of vegetables around 22 years ago near Dadar Railway station. Suraj wasn't able to continue his studies further so he started helping his father in his business. Now he used to sit at mandi from 7AM to 4PM and then later on his father took over for the further day till 11Pm.

They purchase vegetables from truck services. Sometimes they carry vegetables on cycles manually to their place. It's too tiring for them to regularly sit on the ground and handle the customers throughout the day. Suraj's ambition is to sell vegetables in other areas also so that his father can lead the Dadar site and they can get a double income source. Suraj is wishing to own a cart that is economical to him and can also help him sell vegetables in nearby areas.

## Problems

- Have to pay for storage area
- No dedicated space for business
- Sometimes have to run loading vegetables on their head when BMC members come
- Have to sit in open weather conditions
- No protection from rain
- Somehow manages to sell in rain also
- No light at night, need to sit under street lights
- No proper management for garbage space
- Vegetables are exposed to dust, dirt
- Have to manage with tarpaulin to provide extra roof to the vehicle
- Sometimes customers don't prefer to buy groceries
- Not enough space for grocery business

## Some Glimpse from Dadar Mandi (Fig.2.4.1a)



Fig. 2.4.1a Vendors at Dadar Mandi

Photos taken from Dadar mandi shows what issues Vegetable vendors go through in their daily life.

- Vendors at Dadar mandi don't have designated space for their setup.
- During Rainy season all roads get water filled leading to heavy loss of vegetables.
- They don't have any protection from heat of direct sunlight
- Have to pay for the inventory storage.
- As they don't have any access to dumping space , they throw all waste by the side of streets which encourages an unhealthy environment.

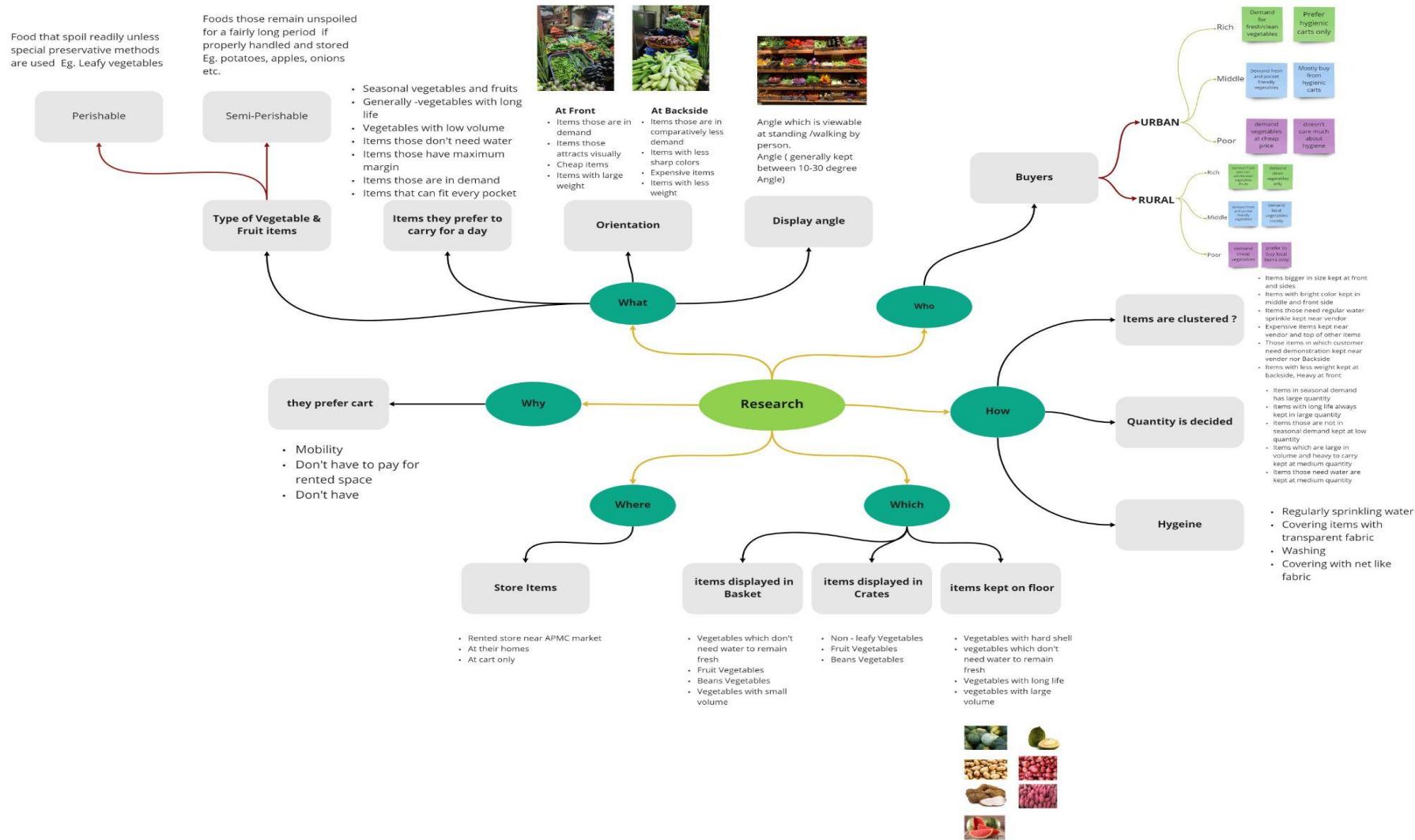
## 2.5\_Mind Map

After interviewing and observing a few vendors key insights were concluded into distinct areas through Mind mapping.

Mind map was deduced into set of directions like :-

- **What** - types of fruits and vegetable items they sell
  - orientation of vegetables
  - display angle
- **Who** - buyers( Urban and Rural)
- **Why** - they prefer cart
- **Where** - they store items
- **Which** - items displayed in crates
  - items displayed in baskets
  - items displayed on floor
- **How** - items are clustered
  - quantity is decided

## Mind Map



# Answers to What?

Food that spoil readily unless special preservative methods are used Eg. Leafy vegetables

Foods those remain unspoiled for a fairly long period if properly handled and stored  
Eg. potatoes, apples, onions etc.

- Seasonal vegetables and fruits
- Generally -vegetables with long life
- Vegetables with low volume
- Items those don't need water
- Items those have maximum margin
- Items those are in demand
- Items that can fit every pocket

Type of Vegetable & Fruit items

Items they prefer to carry for a day

Perishable

Semi-Perishable



At Front

- Items those are in demand
- Items those attracts visually
- Cheap items
- Items with large weight

At Backside

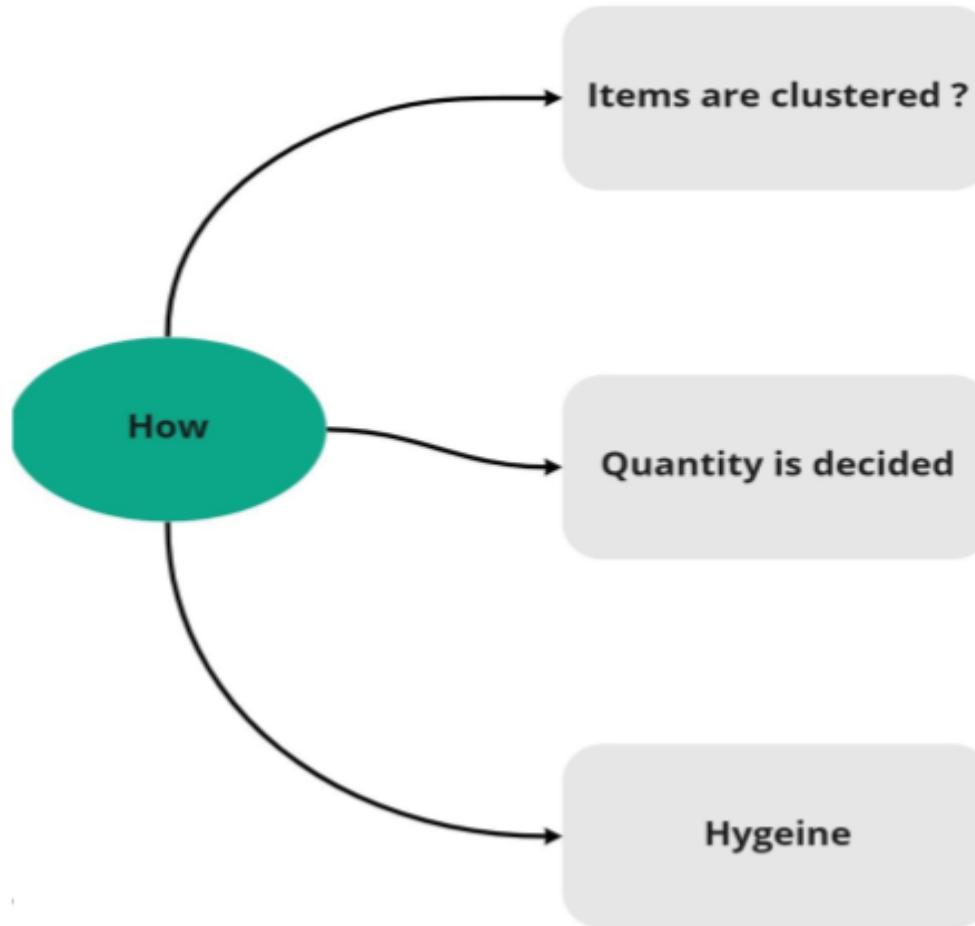
- Items those are in comparatively less demand
- Items with less sharp colors
- Expensive items
- Items with less weight

Orientation

Display angle

What

## Answers to How?

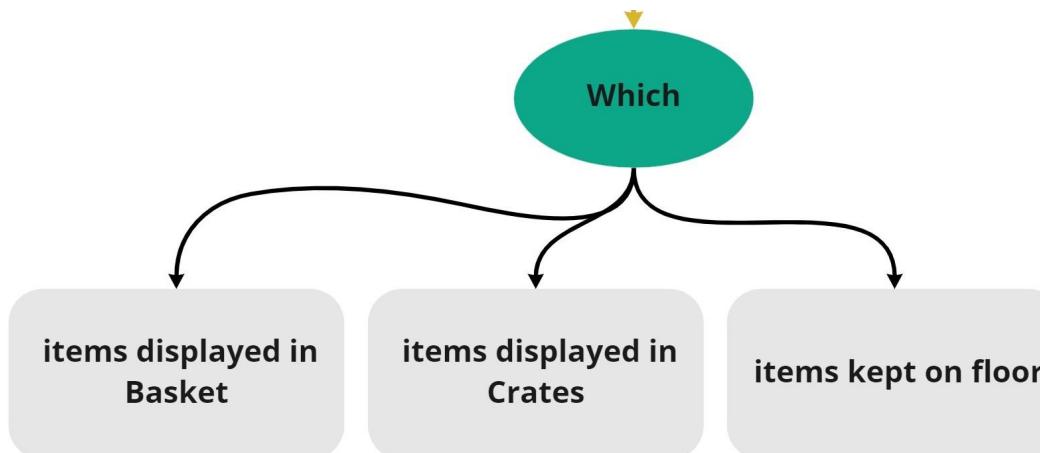


- Items bigger in size kept at front and sides
- Items with bright color kept in middle and front side
- Items those need regular water sprinkle kept near vendor
- Expensive items kept near vendor and top of other items
- Those items in which customer need demonstration kept near vendor nor Backside
- Items with less weight kept at backside, Heavy at front

- Items in seasonal demand has large quantity
- Items with long life always kept in large quantity
- Items those are not in seasonal demand kept at low quantity
- Items which are large in volume and heavy to carry kept at medium quantity
- Items those need water are kept at medium quantity

- Regularly sprinkling water
- Covering items with transparent fabric
- Washing
- Covering with net like fabric

# Answers to Which?



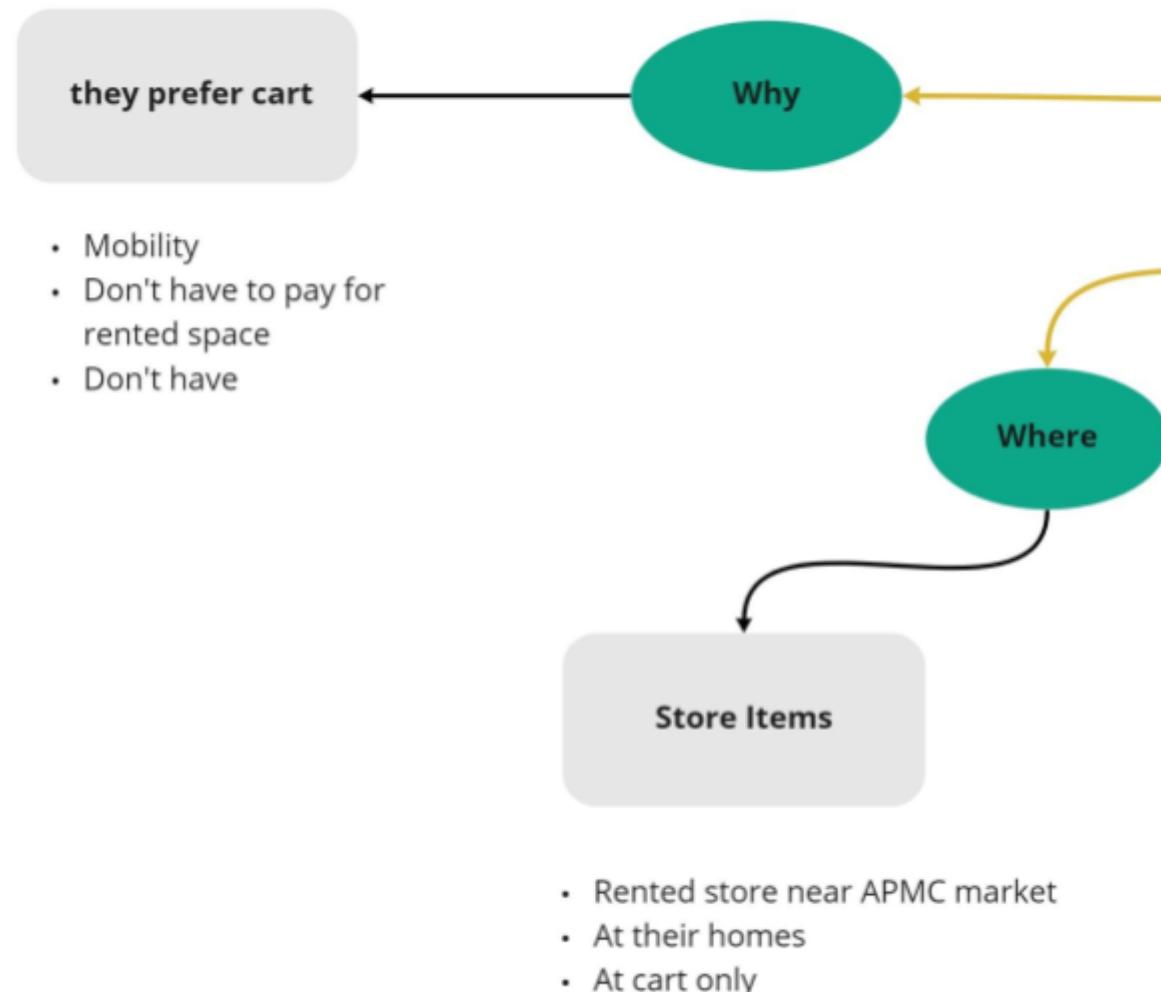
- Vegetables which don't need water to remain fresh
- Fruit Vegetables
- Beans Vegetables
- Vegetables with small volume

- Non - leafy Vegetables
- Fruit Vegetables
- Beans Vegetables

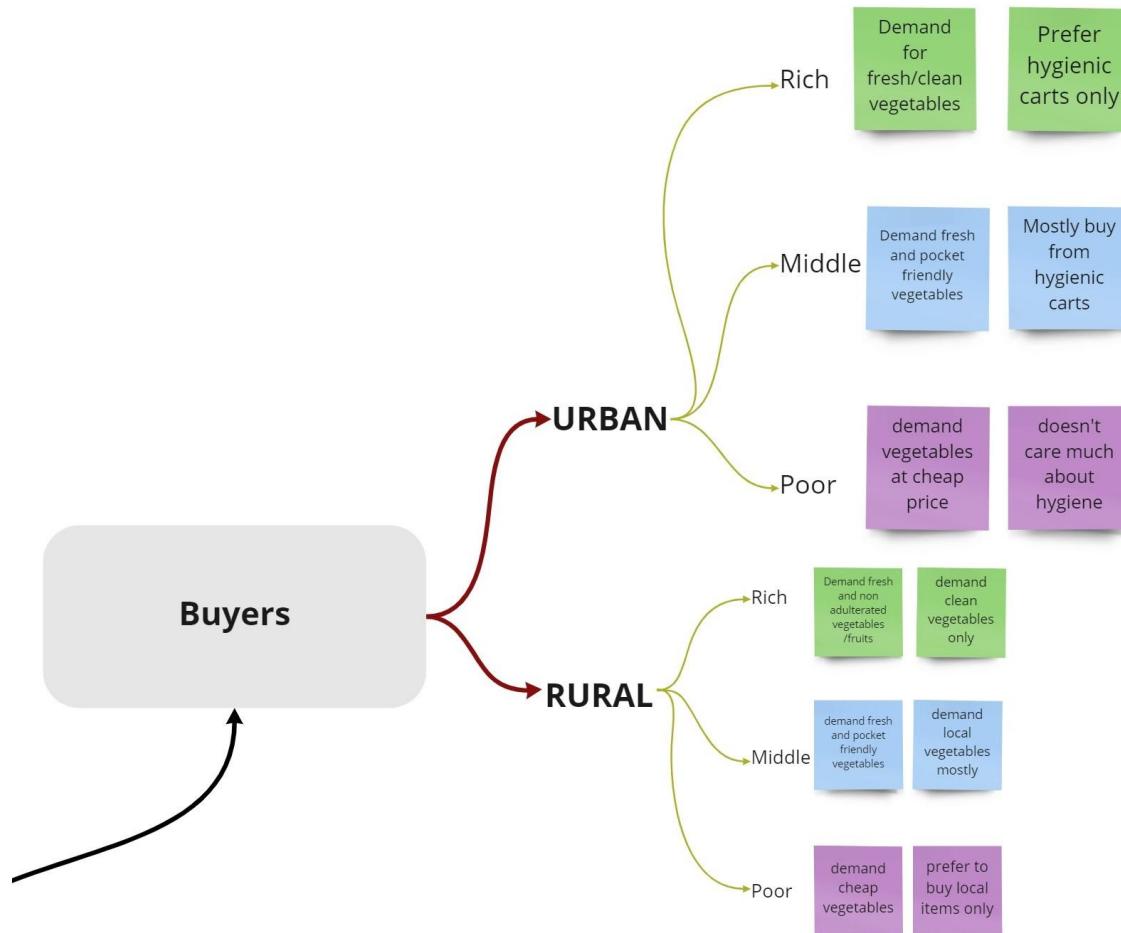
- Vegetables with hard shell
- vegetables which don't need water to remain fresh
- Vegetables with long life
- vegetables with large volume



## Answers to Why & Where?



# Answers to Who?



## 2.6\_Observations

In the existing vehicle, there are multiple issues that vegetable vendors are experiencing . But when it's been asked what all issues they are having? They are not able to fully demonstrate. For that a set of observational study is done.

Below observations are about what all issues vendors are experiencing including existing cart design.

While observing , few key insights appeared to be critical:-

- No space for inventory
- Groceries are clustered which affect the visibility
- No proper protection from weather
- Have to push heavy load manually

Carts are not stable enough when travel on uneven roads	No proper care of hygiene	Groceries are exposed to dusty soil	Loading of pull/push cart depends on the ability of the vendor	There is no protection to avoid theft	Sometimes ran out of water, have to purchase from shops	wastage of water in sprinkling	No space for pre orders storage	No Dedicated space for weighing machines
No dedicated space for personal stuff	No dedicated space for packaging bags	No space for inventory	groceries are clustered in a single space	No shelter except Umbrella	No toilet. No water. No Electricity. Have to arrange all on their own for daily basis	Some vegetables exposed under sun release their freshness	As the needs for sanitizing (cleaning) has increased since Covid era, there is no such concern to avoid it	No safe storage for knife
Extra efforts in pushing/pulling cart	No dedicated space for sitting, sometimes need to sit on cart only which affect the profit	effect of maintenance cost on profit	Managing through tarpaulin roof , which is not rigid enough to withstand rough weather	issue with material quality of the cart	managing the freshness of groceries either by covering them with jute gunny bag , or by directly sprinkling water	Daily Commuting is an issue with cart	managing according to their convenience	where they sits needs to pay

## 2.7\_How do they Sell

When it comes to running a business , everyone has their own way of doing it . Vegetable vendors also used to sell items in a way that they can get more and more profit.

Like:-

1. Some of them prioritize the vegetables based on their freshness and orient them accordingly.
2. Reduce the amount by the end of the day , so that they can buy fresh ones for the next day.
3. Announce prices loudly
4. Reduce the amount on bulk purchase.

Usually try to sell old items first	Items prone to perishability ,sold at lower price	offer buyer less charges if they buy in bulk	Sometimes display nice fresh looking fruits at front and sell the rotten ones	announcing prices by shouting or by using loudspeaker	to convince customer ,they slice vegetable/fruit items
Prices fall short by end of the day	Sometimes bluff with the customer	vary prices according to the users	Display green vegetables under green light to show them more greener and fresh (Attractive)	if there is no customer throughout the day, they tend to sell at below profit margin	

## 2.8\_Psychological Research

Being in the profession for a long period of time. It has become a tendency of vendors that they don't feel any urge to modify solutions to run their business better. To know what and how they approach their profession a psychological study has been done.

have become used to with the business, feel no urge of change

sticks with the existing solutions

Reserved in their profession

stereotypical approach in not trusting the technology

has flexible solution according to their convenience

Don't want to take risk to spend on resources

Work according to their own preference

Some people have gender specific approach towards this business

Proud of what they are doing

Believes that they can solve problems by their own

Due to less aware of the solutions

## 2.9\_Insights

A small study on

- where do they store
- How much do they pay for the cart rent
- How many times a week they purchase vegetables and fruit items.
- Why do they prefer to do this business?

Few venders used to store groceries ,where they live

Need to pay 40-50Rs/day for pull push cart

Purchase groceries items once or twice a week ,which can withstand for 7-8 days

Purchase grocery from whom charge less, or debt from known one

Vegetables might fall down from the cart it is moving

Loves to do this because of Flexible timing

### 3. Value added services

To get more profit most of the vendors used to provide facilities to the customers by providing value added services like delivering at door to door steps (Fig.3.1) , this value helps the customers not to leave for the market due to time boundations. Other than this they provide facilities like cutting vegetables with hard shells or leafy vegetables which usually saves time for the customers.



Fig.3.1 Doorstep Delivery

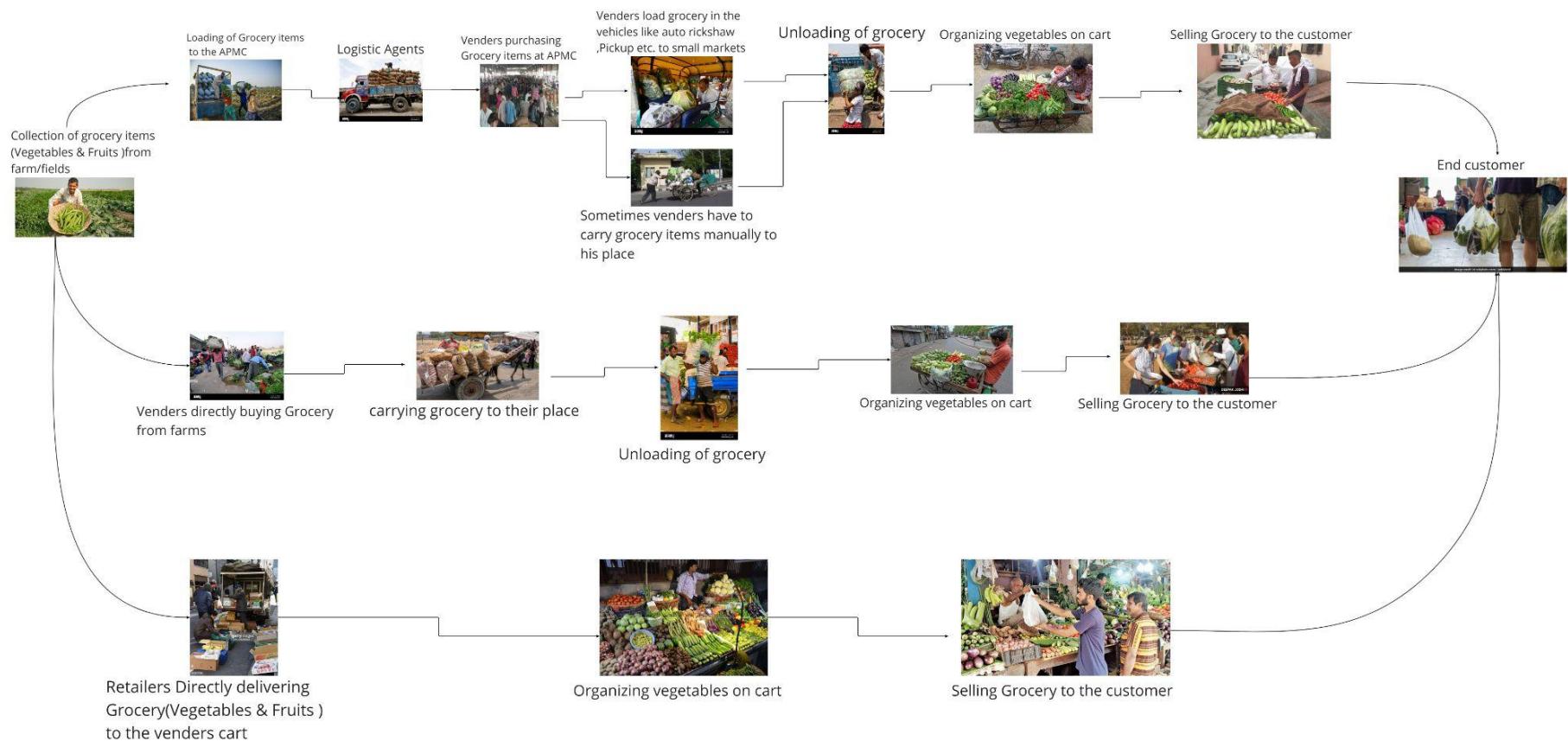
Delivering at doorsteps



Cutting Vegetables for  
customer convenience

\*image source- <https://www.tribuneindia.com/news/haryana/out-of-work-many-turn-street-vendors-83134>

## 4. Context Study



## 4.1\_A day at Vashi APMC : From Midnight to Afternoon



Fig.4.1a Vashi APMC Market

A regular day situation from Mumbai's Vashi APMC marketplace wherein normal over 225 vehicles loaded with greens and culmination at round 2 AM reaches Kalyan's APMC marketplace. These vegetable vehicles after touring all manner lengthy from diverse states of India like Maharashtra ,Karnataka, Haryana, Punjab , Madhya Pradesh ,Gujarat attain the APMC marketplace of Mumbai.

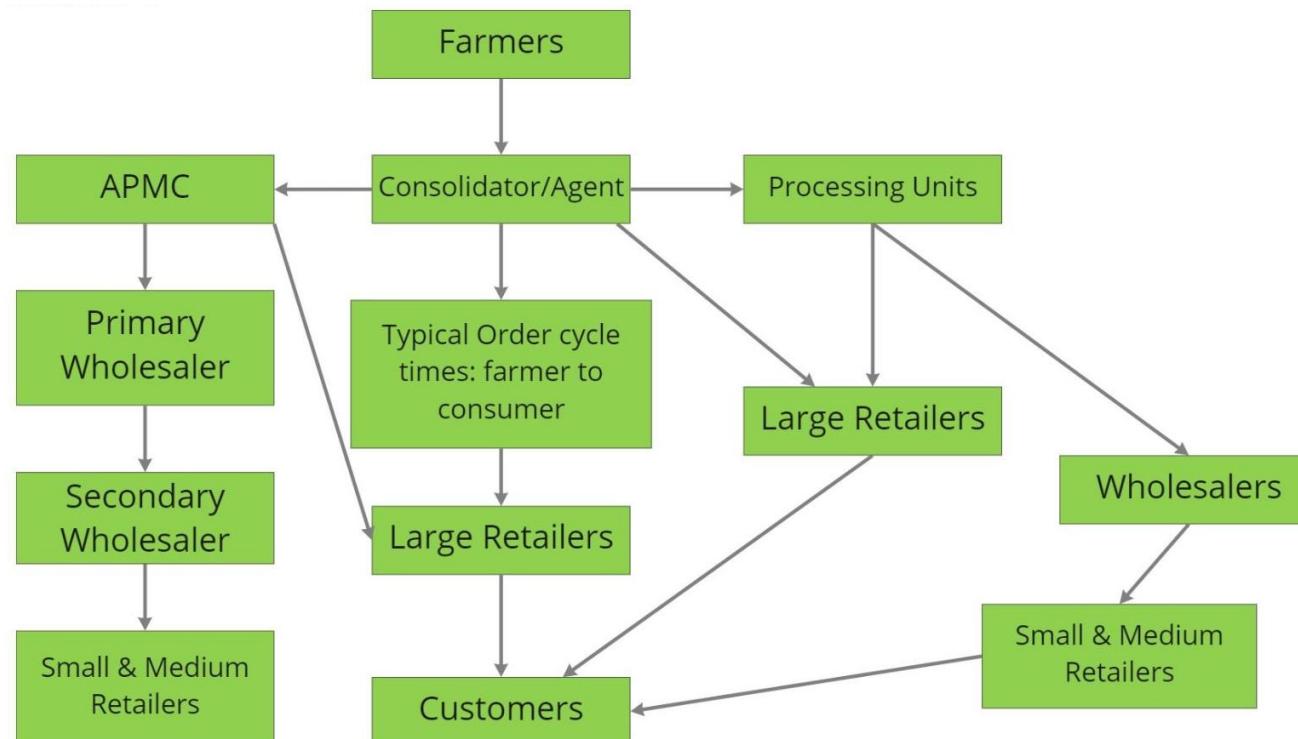
Vegetables like onions and tomatoes commonly get here from the farms of Maharashtra whilst cauliflowers ,potatoes, peas are being transported from parts of Punjab and Gujarat.

After the vehicles arrive on the marketplace, heaps of greens are unloaded with the aid of labor at APMC marketplace. These unloaders commonly receive a commission Rs 3- Rs7 consistent with 50 kg of weight. After that those shares of greens are offered to the neighborhood shoppers like vegetable vendors . And stock of the greens get dispatched to the opposite marketplace areas of Mumbai. (dnaindia 2019)

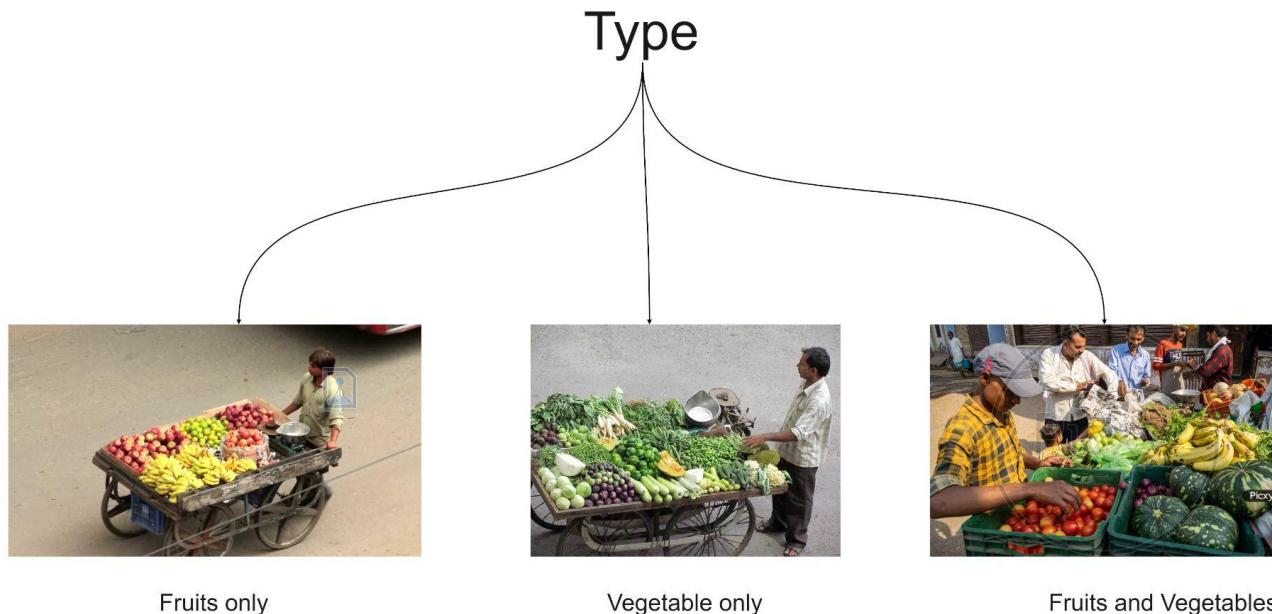
\*image source - <https://www.dnaindia.com/mumbai/report-maharashtra-how-veggies-land-on-your-table-2732162>

## 4.2\_Stakeholders

Farm produce transferred further by the Farmers to the APMC market , Consolidator and Processing Units. After that APMC market transfers the produce to the Primary wholesalers and large retailers. Large retailers then sell it to the Secondary Wholesalers and then it finally reaches to the Customers and Small- Medium Retailers.



## 5.Vendors

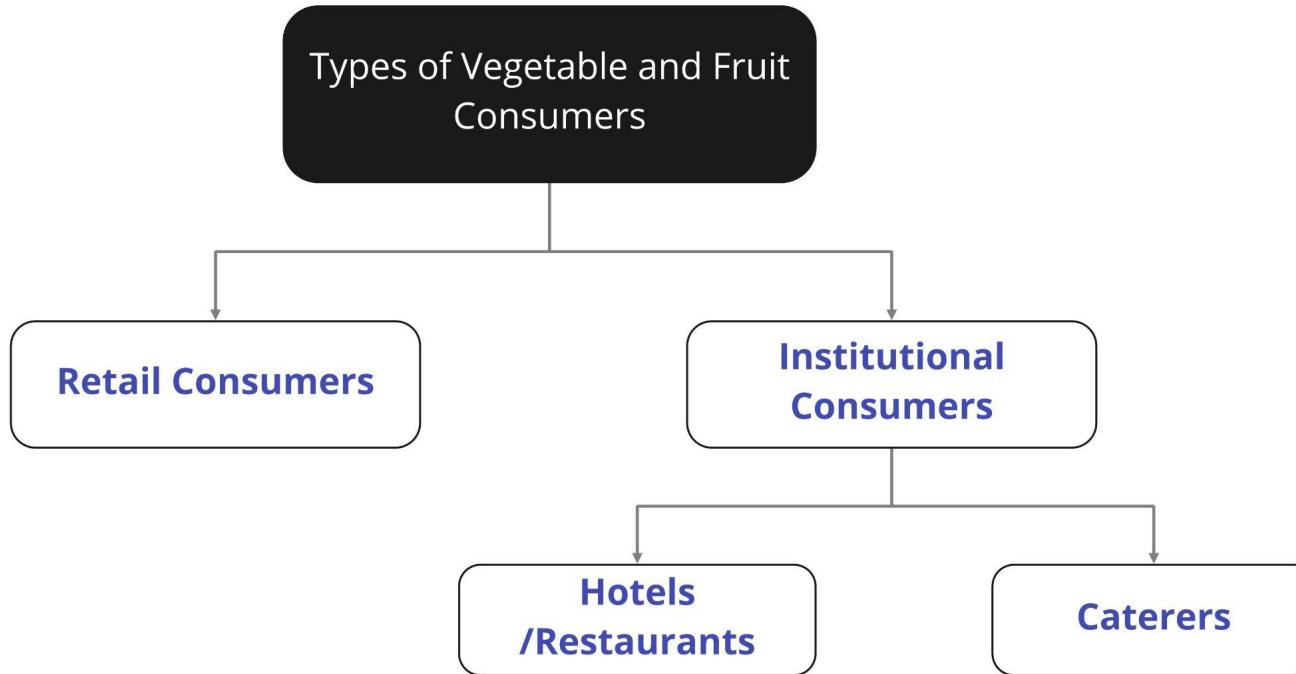


There generally three types of Vendors :-

Fruit Seller- Used to sell fruits only on their cart

Vegetable Seller- Used to sell vegetable items only

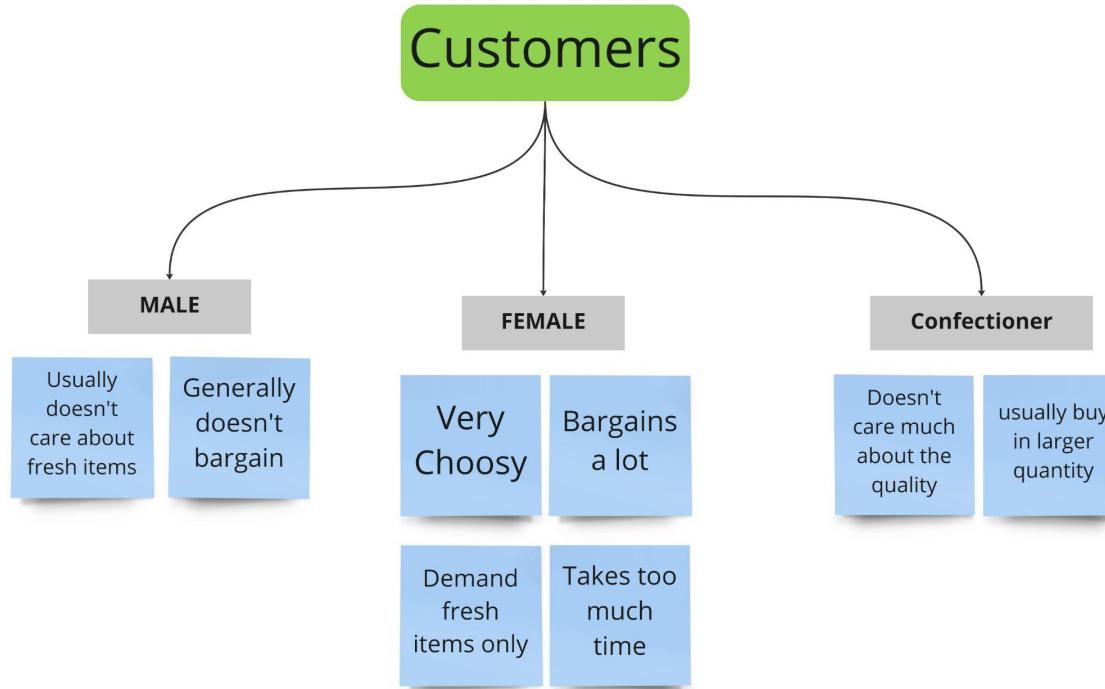
Fruits and Vegetable Seller - Used to sell both Vegetables and fruits on their cart



There are types of Vegetables and fruit Consumers in:-

**Retail Consumers** - Consumers who buy Vegetables and fruits in a large quantity from producers.

**Institutional Consumers** - Institutional Consumers include Hotel/Restaurants and Caterers who buy farm produce for their personal use.



Types of Customers :-

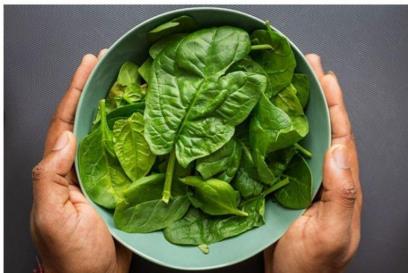
A short insights on what type of customers ,vendors used to handle in their profession

**Female**- Female customers usually demand fresh and low priced items. Generally takes more time.

**Male**- Male customers take less time in choosing vegetable items . They usually don't ask to bargain.

**Confectioner**- They are the type of customer who doesn't care much about the quality as they have to buy in large quantities.

# Vegetables list



**Leafy Greens or Leafy Vegetables**

Amaranth  
Colocasia Leaves  
Coriander Leaves  
Curry Leaves  
Dill  
Drumstick Leaves  
Fenugreek Leaves  
Lettuce Leaves  
Mint  
Mustard Seeds Leaves  
Sorrel Leaves  
Spinach  
Turmeric Leaves



**FLOWER VEGETABLES**

Banana Flower  
Broccoli  
Cabbage  
Cauliflower

**Leafy vegetables** also called dark green leafy vegetables, leafy greens, or greens, are edible plant leaves. As the name implies, people can typically identify these vegetables by their green color and edible leaves.

**Flower vegetables** are plants of which the flowers are used as food.

\*Image source- <https://images.app.goo.gl/7qXZnPpkfGppvngn9>  
<https://www.freedomfoodsindiana.com/>



FRUIT VEGETABLE



STEM VEGETABLE

Bitter Gourd  
Bottle Gourd  
Brinjal  
Broad Beans  
Capsicum  
Cluster Beans  
Corn  
Cowpeas  
Cucumber  
Drumstick  
French Beans  
Green Chilies  
Green Peas  
Indian Gooseberry  
Indian Squash  
Ivy Gourd  
Jackfruit (Raw)  
Lemon  
Mango (Raw)  
Okra (Lady Finger)  
Papaya (Raw)  
Pointed Gourd  
Pumpkin  
Raw Banana  
Red Chili  
Ridge Gourd  
Snake Gourd  
Spiny Gourd  
Tomato  
Waterchestnut

Celery  
Asparagus  
Kohlrabi  
Broccoli  
Bamboo Shoots  
Rhubarb  
Banana Stem  
Lotus Stem

A fruit develops from the flower of a plant, while the other parts of the plant are categorized as **Fruit Vegetables**. (Link, Khan, and Curley 2017)

**Stem Vegetables** are plant stems used as vegetables.

\*image source-  
<https://sproutmonk.com/indian-vegetables-names-list-in-hindi-english/>  
<https://unsplash.com/photos/jhd02zBhqV0>



### ROOTS, BULBS, AND TUBERS VEGETABLE

Potato  
Onion  
Ginger  
Garlic  
Carrots  
Beetroot  
Yam  
Turnip  
Sweet Potatoes  
Shallots  
Radish  
Purple Yam  
Turmeric  
Colocasia Roots



### Green Beans

Green Beans  
Haricots Verts  
Long Beans  
Purple String Beans  
Romano Beans  
Wax Beans

**Root vegetables** are starchy veggies that grow underneath the soil. The starchy part, called the storage organ, grows underground while other parts of the plant grow through the soil and to the surface. These root vegetables have a large bulb where nutrients are stored. (Brennan 2021)

A class of vegetables that includes beans, peas and lentils are considered as **Beans Vegetables**.

\*image source- <https://lukecoutinho.com/blog/nutrition-en/carrot-health-benefits/>

<https://www.thespruceeats.com/types-of-green-beans-4047242>

## 6. Perishable Items



Fig. 6.1.a Perishable Items

Study on perishable items is done to know what types of items they prefer to carry based on the vegetable life. Also How do they manage to maintain the freshness of perishable items? After observing it's been observed that they prefer to carry perishable items in small quantities more.

### Perishable foods(Fig.6.1.a) :

Cannot be stored for more than one or two days at room temperature, that is, they have a shelf life of 1 or 2 days. Milk is a good example of perishable food.

## Semi-Perishable Items



Fig.6.1.b Semi-Perishable Items

**Semi-perishable foods (Fig.6.1.b) :** Can be kept for a couple of weeks or even a month or two. They have a longer shelf life than perishable foods. (NIOS 2012)

Study on Semi-Perishable items is done to know what type and what quantity vendors prefer to carry . After getting some insights it came to know that vegetables that are less prone to perishability are carried in large quantities.

## 6.1\_Vegetables and Fruits Perishability

Items	Shelf Life
Beans (green)	4-5 days
Carrot	15-20 days
Cucumbers	4-5 days
Cabbage	8-10 days
Green chilli	1.5-2 weeks
Couregettes	5-10 days
Brinjal	1 week
Melons	5-12 days
ladyfinger	5-8 days
Onion (dry)	1-4 months
Potatoes (white)	1-2 months
Potatoes (sweet)	1-3 months
Tomatoes(ripe)	4-7 days
Tomatoes (green)	1-2 weeks

Items	Shelf Life
Grapes	4-5 days
Pear	5-7 days
Stone fruits	5-8 days
Peas	4-7 days
Coconut	1-2 Months
Guava	2-3 days
Jackfr	1.5-2 weeks
Kiwifruit	5-12 days
Lychee	3-4 days
Sapodilla	1-1.5 weeks
Papaya	5-8 days
Peach	5-7 days
Mushroom	1-2 days
Leafy vegetables	1-2 days
Pomegranate	1-1.5 weeks
Cauliflower	7-10 days
Pumpkins	1.5-2 weeks

Items	Shelf Life
Watermelons	1-2 weeks
Apples	8-12 days
Avocados	1 week
Mangoes	2-3 weeks
Pineapple	2-4 weeks
Bananas	3 days
Basil	1-1.5 weeks
Beetroot	10 days
Broccoli	5 days
Garlic	2 months
Ginger	1 month
Green Onion	1-1.5 weeks
Lemons	2 weeks
Oranges	5-7 days
Strawberries	3-4 days
Turnip	10-15 days
Sweet corn	2-4 days
Radish	1-1.5 weeks

Data on Life of each vegetable collected to know ,till how many days individual items can withstand the shelf life .And how vendors do manage the quantity. It's been observed that items which remain fresh throughout a week are purchased at once a week.

## 7. Types of Vegetables Storage,weighing and packaging

Data on items like packaging, weighing and storage that are being used by the vendors when selling vegetables collected. Items like

**Jute Gunny bag** - can be used to carry semi perishable items or items with hard shells like onion , potato etc. Also large quantities of items can be carried in it.

**Wooden Crates**- Used for the items which require hyper cooling. Has a higher strength , also it's easy to transport.



**Jute Gunny Bag**

50kg Bag

Price - Rs 50-Rs60/ piece



**FEATURES :**

Capacity ranges from 1g to 30kg  
STAINLESS STEEL Body with MS bottom  
SS platter with 240x300 mm size  
High bright Red/Green LED colour Changing display  
In built battery backup is standard for all models  
Power supply : 230 V AC +-10%, 50 Hz  
Price- Rs4500/item



**weighing scales cast iron weight  
test calibration weight**

Price - Rs 750/set



**Wooden Crates**

Dimensions OD (L x B x H):- 540x357x290 mm  
Dimensions ID (L x B x H):- 500x326x285 mm  
Capacity:- 15kg-20kg  
Price:- Rs80-Rs100/Piece

**Plastic Crates** - higher strength and it has provision to provide ventilation to the items.

**Polyethylene bags** - These bags are used because of their cheap price and also it has a transparent layer which allows easy inspection.



#### Bamboo Baskets

Dimensions:-

Dia - (65cm-70cm)  
Depth- (25cm-30cm)  
Weight capacity - (30kg-35kg)  
Price- Rs100/Piece



#### Plastic Crates

Dimensions OD (L x B x H):- 540x357x290 mm  
Dimensions ID (L x B x H):- 500x326x285 mm  
Capacity:- 48 Ltr  
Price:- Rs250 -Rs 300/Piece



#### Polyethene bags

2kg Bag  
Price - Rs 275/200 pcs

5Kg Bag  
Price - Rs 1200/1000 pcs



#### HMPE bags

25kg Bag  
Price - Rs 10-Rs15/ piece



#### Blancing Scale

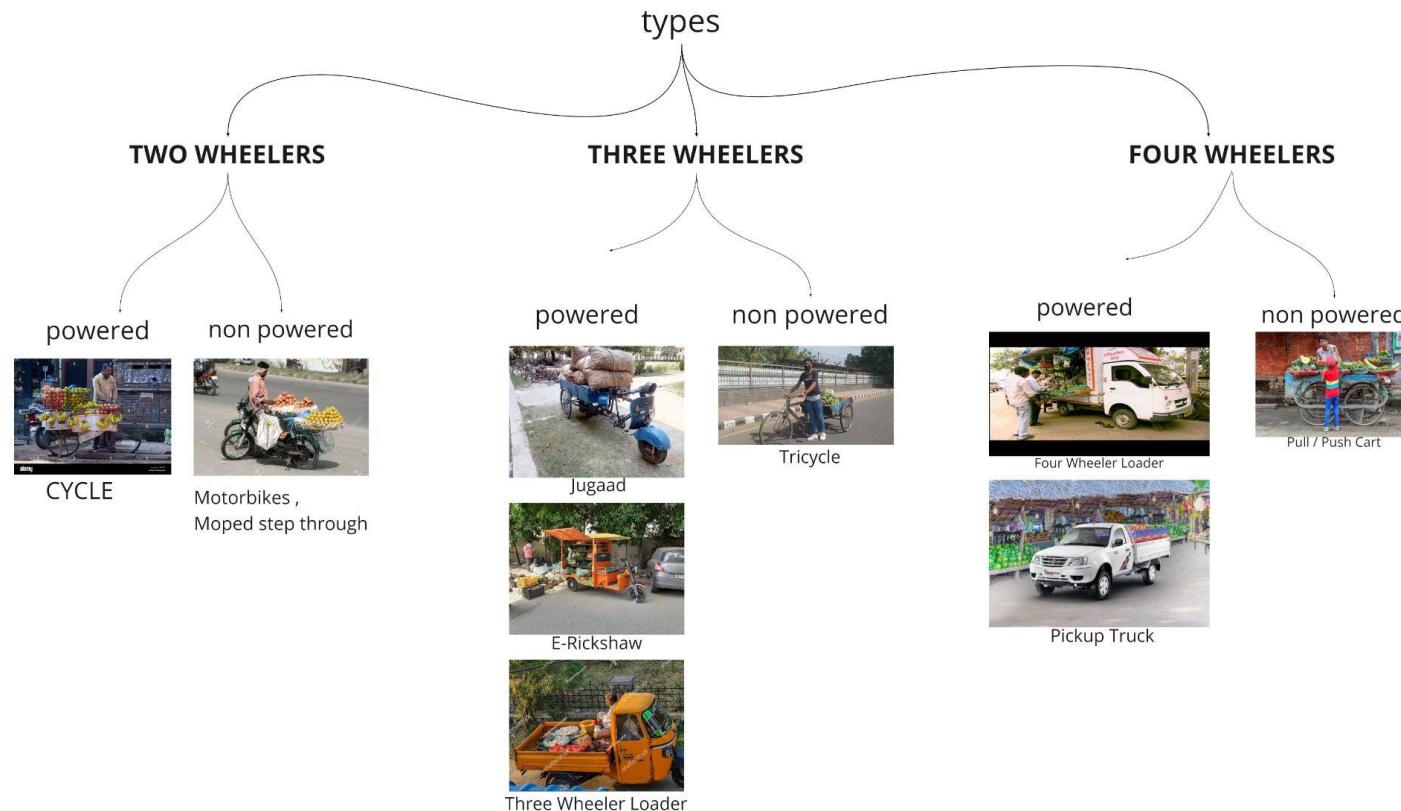
Weight - 1Kg  
Price - Rs500/piece



#### weighing Machine

Dimensions  
Length- 45cm  
Width- 30cm  
Weight- 3.2 kg  
  
Price - Rs 1800-Rs2000/set

## 8. Vehicle Types



# Vehicle Study

VEHICLES	DIMENSIONS	WEIGHT CARRYING CAPACITY	PRICE	PROS	CONS
	Width- 162.56 cm Height- 81.28 cm Depth- 22.86 cm Weight- 18.6 kg	100kg-120 kg	Price- Rs8000	Small Footprints No fuel Required Lightweight	Need Physical Efforts to ride Not enough space for storage No shed
	Width - 670 mm Length-1895 mm Height-1077 mm Weight- 89 kg	140 kg	Price - 45k - 55k	Small Footprints Less fuel required Lightweight No effort required to ride	Can't carry heavy load No shed or weather protection Can carry limited load
	Length- 1828mm(approx.) Width - 1219mm(approx.) Weight- 110kg-120kg	180kg-200 kg	Price- Rs 20K-Rs 25K	Stable structure No fuel Required Heavy Weight carrying capacity	Need extra efforts to pull No protection to groceries and vendors from weather issues Slow
	Length- 1524mm Width - 1066.8mm Weight- 100kg-120kg	150kg-180 kg	Price- Rs 18K-Rs 20K	Small Footprints No fuel Required Lightweight	Need extra efforts to pull No protection to groceries and vendors from weather issues Slow
	Length- 2800mm Width- 1000mm Height- 1800mm Weight- 180kg	500kg-600 kg	Price - Rs 1.4 Lakh	Economical Can carry huge weight enough space	Due to less track width ,get topple easily Non protection from rain Not suitable to run on every terrain
	Wheelbase- 1920mm Overall Width- 1490mm Length- 3145mm Overall Height- 1770mm Ground Clearance- 245mm	500kg	<b>Variants Price</b> Diesel- ₹ 2,45 - 2.52 Lakh CNG- ₹ 2,45 - 2.49 Lakh	Fast stable structure Can carry heavy load	No roof for protection Fuel requirements Exposed Storage area
	Length - 3800mm Width - 1500mm Height - 1842mm Wheelbase - 2100mm Ground Clearance - 160mm Cargo Box Dimensions : 2200 mm X 1490 mm x 300 mm	750 kg	Tata Ace Gold Petrol 1615₹ 4.41 - 5.47 Lakh Tata Ace Gold Diesel 1670₹ 4.41 - 5.27 Lakh Tata Ace Gold CNG 1630₹ 4.41 - 5.46 Lakh Tata Ace Gold Diesel Plus 1675₹ 4.00 - 5.78 Lakh Tata Ace Gold CNG Plus 1630₹ 6.15 - 6.38 Lakh	Fast stable structure Can carry heavy load than other small vehicles Comfortable seating for driver	No protection from weather to the storage area Fuel requirements are high Expensive

Different types of Vehicles used for vegetable carts have been studied . It's been observed that assistive vehicles like motorized vehicles have high prices which are not economical to most of the vendors. Also motorized vehicles make it easy to carry heavy loads and make commuting easier.

## 8.1\_Existing Cart Dimensions



### **8.1.1\_Limitations :**

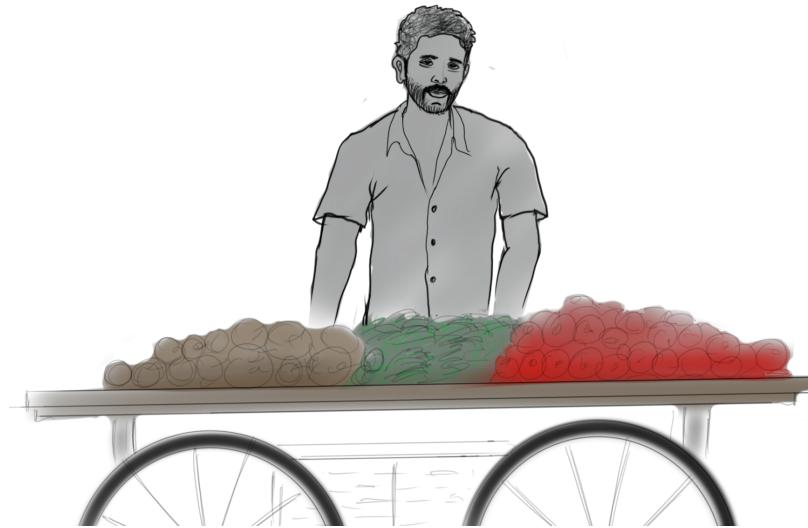
1. Existing cart has no organized space for vegetables.
2. No dedicated space for inventory
3. No protection from rain, sunlight etc
4. No provision for sitting
5. Limited storage
6. No dedicated space to dump the waste
7. No dedicated platform for weighing machine
8. No assistance to push the cart
9. No identity

## 9. Design Brief

**To design a Low Cost Mobile Grocery Cart that ensures a safe , comfortable and profitable experience for the vendor throughout the year and weather conditions. It should help the vendor maintain productivity and increase the sale leading to a higher profit .**

### **9.1\_Design Requirements :-**

1. The Cart should have extended closed roof system to provide safety from weather
2. Grocery compartment should in be incorporated with modular containers and racks
3. There should be have spray like system to maintain the freshness of groceries
4. To reduce the musculoskeletal disorders there should be assistive support eg. Back support while sitting
5. Vegetable cart should have proper visibility to the consumer (exposed racks & containers)
6. Vehicle should have dedicated storage to maintain the inventory
7. Vehicle structure must have a suitable balance structure so that it can withstand the varying load, and can carry load on all kinds of terrains.
8. Vehicle should be able to carry at least thrice the dead weight of the vehicle.
9. Vehicles should have provision to value added services like cutting machines etc.
10. Vehicle should have a special identity like Vibrant display banners ,sounds etc.



## 10. Persona

**Name-** Sumer Mohan

**Age:** 35

**Location:** Moradabad, Uttar Pradesh

**Married**

**Kids:** 2 Children (4- & 6-year-old)

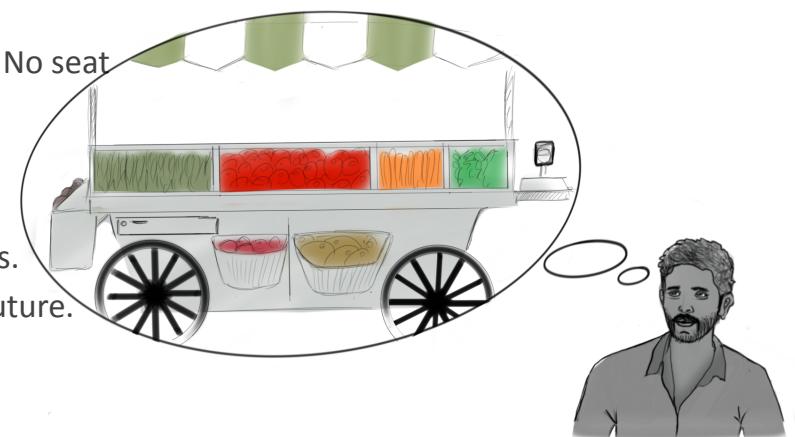
**Qualification:** Matric Pass

**Characteristics:** Positive, Energetic, Entrepreneurial

**Primary Income Source:** Vegetable cart

**Relation with vehicle:** Owner

- Current Vegetable cart is inadequate- Less spaced, Unreliable, Not organized space, No space for backup, no weather protection, No seat
- Have to struggle while customer's demand is more
- hygiene issues
- Seeking for a multifunctional setup which can fulfill the needs of peak sale and give him a profit to look for his family needs.
- His Dream is to run a small successful business for his kid's bright future.



## 11. Benchmarks



## 12. Ideations

### Concept 1



**Vendor**

**Customer**

Reachability	██████□□
Drivability	████□□□□
Access Space for packaging like stuff	████□□□□
Provision to weighing machine	████□□□□
Access to carry more items	████████□□

Reachability	████□□□□
Price Tag	████□□□□
Visibility	████□□□□
Provision to Partitioned Item	████□□□□

Concepts being explored on the basis of usability by the vendors as well as customers . For that a matrix is being prepared which critically focuses on the uses of carts.

## Concept 2



	<b>Vendor</b>	<b>Customer</b>
Reachability	██████	██████
Drivability	██████	██████
Access Space for packaging like stuff	██████	██████
Provision to weighing machine	██████	██████
Access to carry more items	██████	██████

Concept 2 has no provision to weigh machines like space. Also there no price tag is being provided for the user convenience. Although space for storage has been increased, there is no assistance to run the cart.

## Concept 3



**Vendor**

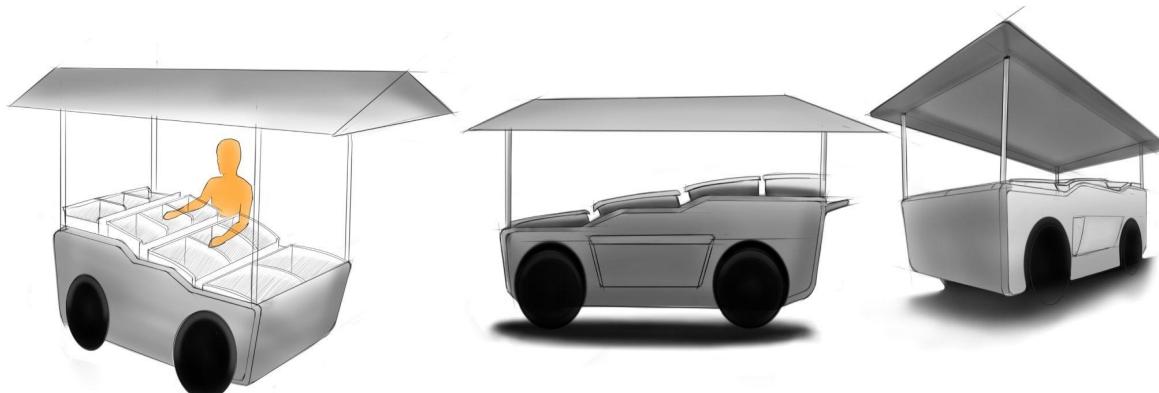
Reachability	█ █ □ □ □
Drivability	█ █ □ □ □
Access Space for packaging like stuff	█ █ █ □ □
Provision to weighing machine	█ █ □ □ □
Access to carry more items	█ █ █ □ □

**Customer**

Reachability	█ █ □ □ □
Price Tag	█ █ □ □ □
Visibility	█ █ □ □ □
Provision to Partitioned Item	█ █ █ □ □

Concept 3 has very low reachability for both users, also it would affect the visibility of the vehicle.

## Concept 4



Vendor

Customer

Reachability



Drivability



Access Space for  
packaging like stuff



Provision to weighing  
machine



Access to carry  
more items



Reachability



Price Tag



Visibility

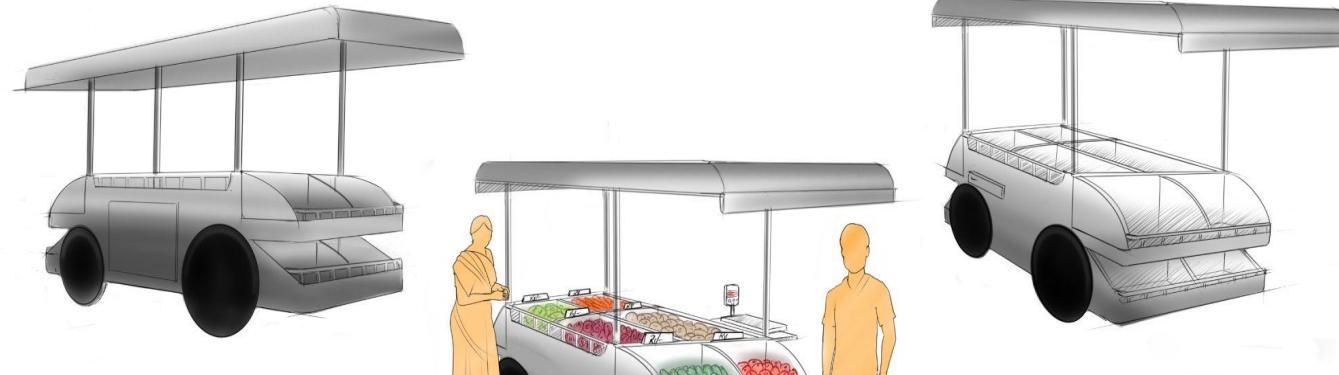


Provision to  
Partitioned Item



Concept 4 has no space dedicated for large quantity items like all season items. Space is not organized in a way that can enhance usability.

## Concept 5



**Vendor**

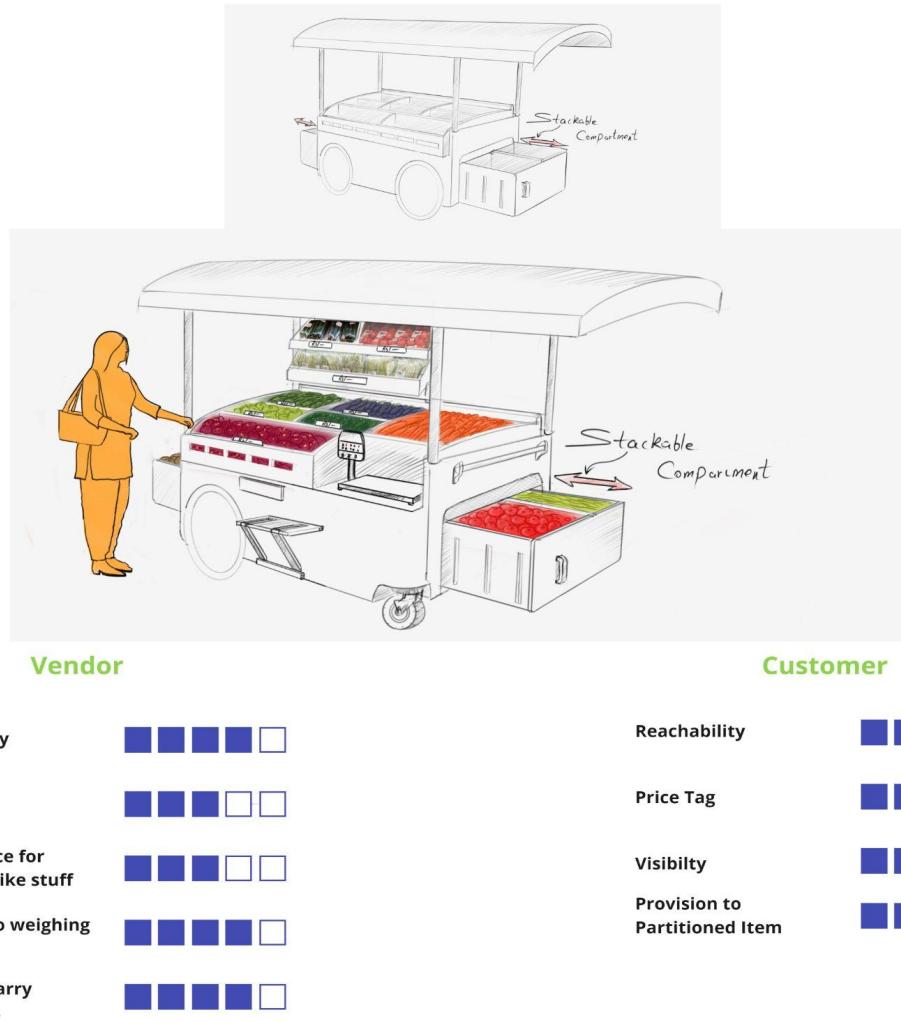
Reachability	█ █ █ █ █
Drivability	█ █ █ █ █
Access Space for packaging like stuff	█ █ █ █ █
Provision to weighing machine	█ █ █ █ █
Access to carry more items	█ █ █ █ █

**Customer**

Reachability	█ █ █ █ █
Price Tag	█ █ █ █ █
Visibility	█ █ █ █ █
Provision to Partitioned Item	█ █ █ █ █

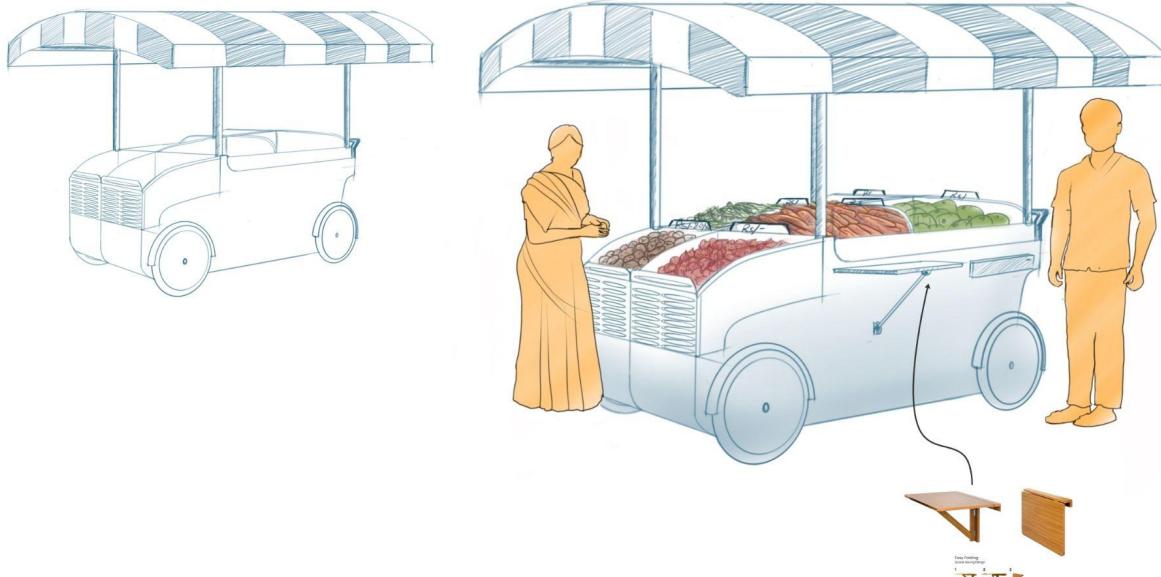
Although concept 5 has more compartments to it , customers will face issues in collecting vegetables from the lower compartments which is ergonomically unfit.

## Concept 6



Concept 6 has more compartments to carry vegetables. But it has space occupied for a weight machine, which can be used to place other vegetables.

## Concept 7



**Vendor**

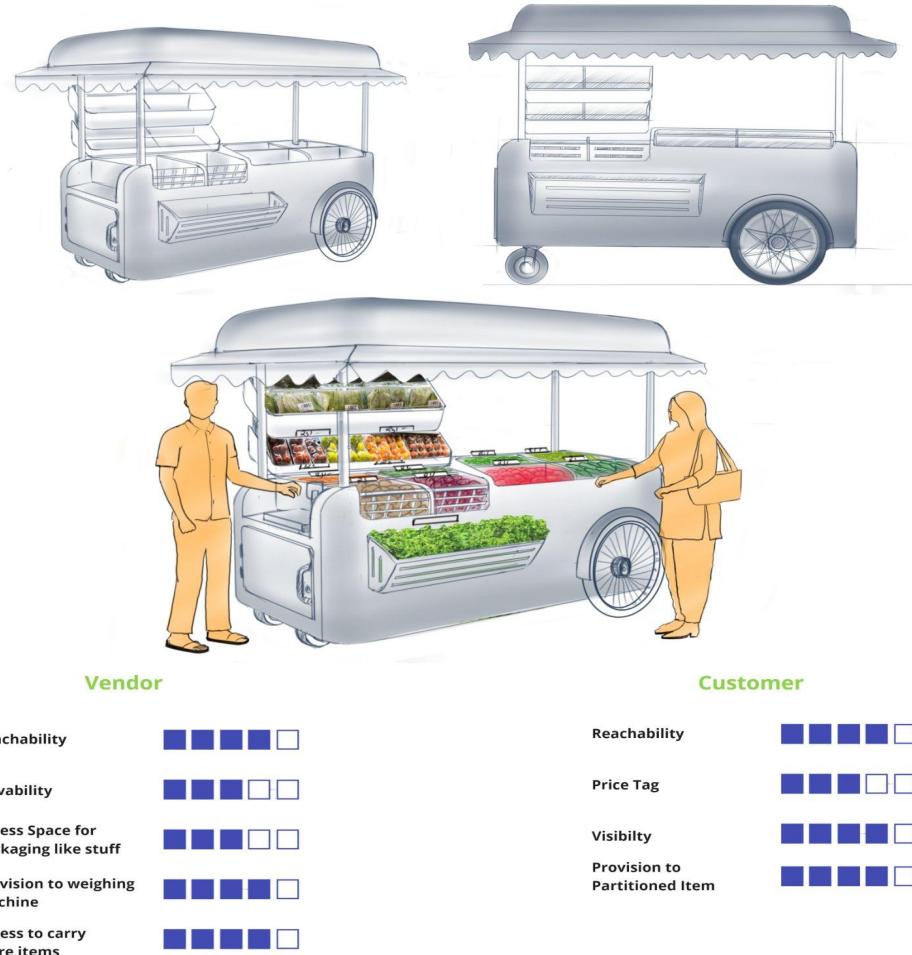
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Drivability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Access Space for packaging like stuff	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Provision to weighing machine	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Access to carry more items	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

**Customer**

Reachability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Price Tag	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Visibility	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Provision to Partitioned Item	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

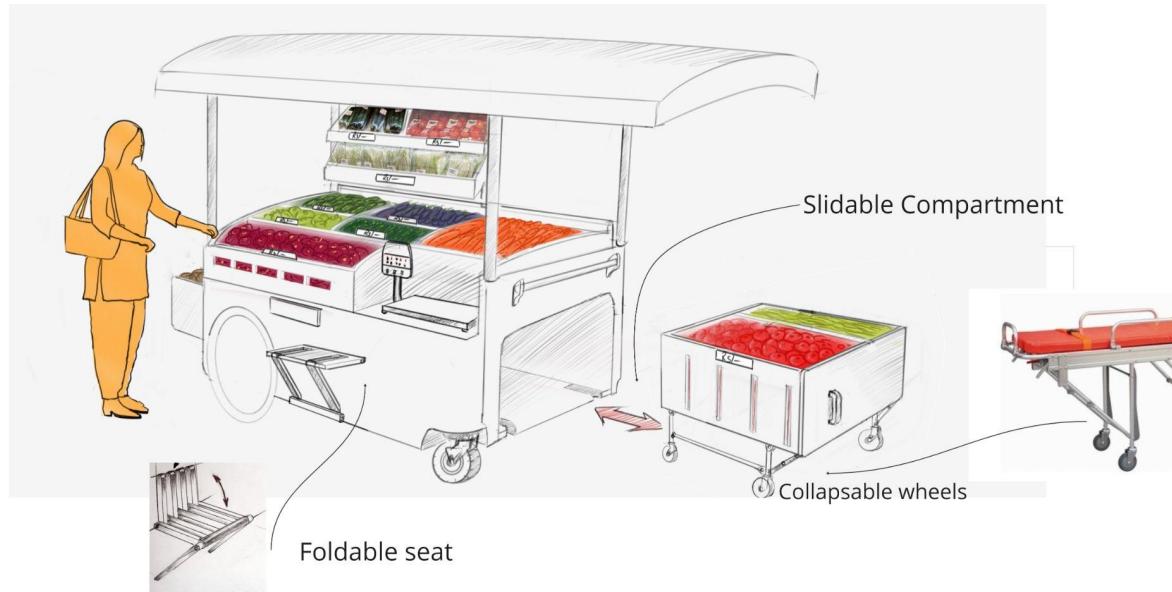
Concept 7 has bigger compartments but it has less provisions to carry a variety of items.

## Concept 8



Concept 8 has well organized space , but it also has space occupied by a weight machine which is again affecting space for vegetables.

# Concept 9



Concept 9 has more space oriented for more vegetable (slidable compartment) carts. But looking practically compartments has a large weight but it needs more rigid supports to stand .

## Vendor

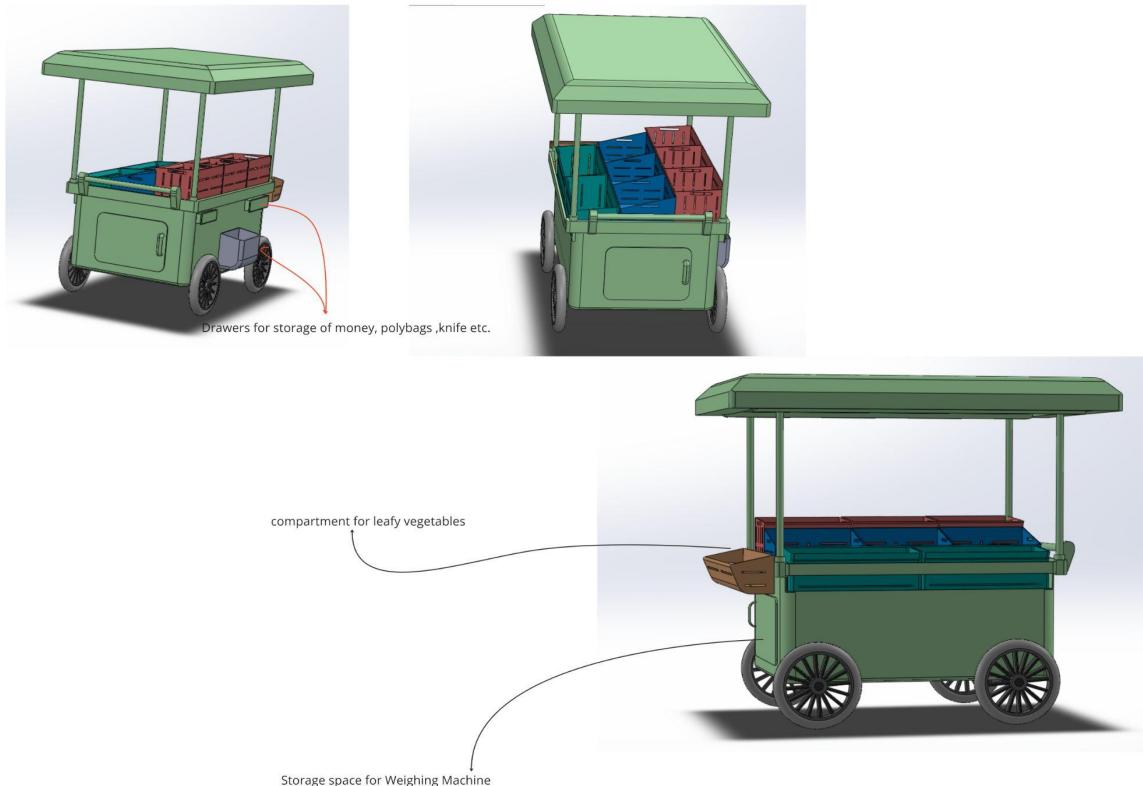
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Drivability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Access Space for packaging like stuff	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Provision to weighing machine	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Access to carry more items	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>

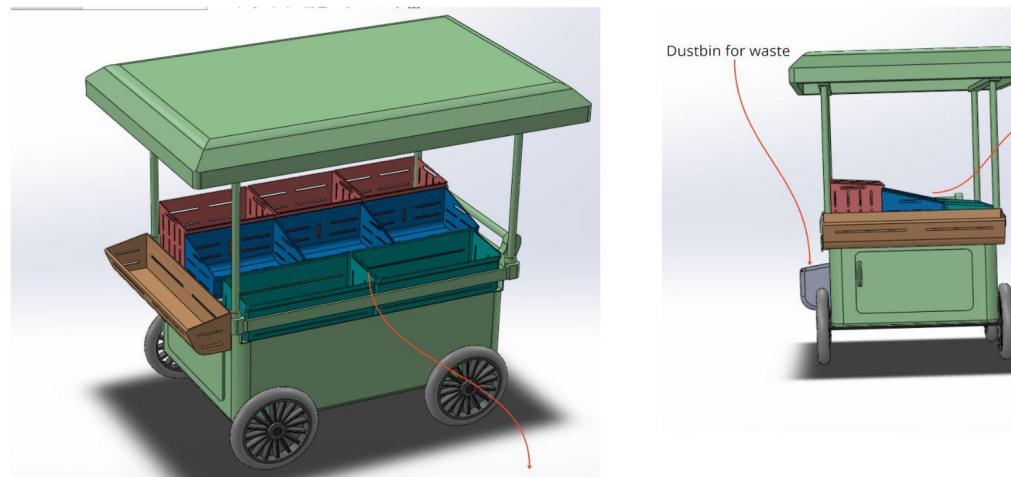
## Customer

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Price Tag	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Visibility	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Provision to Partitioned Item	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

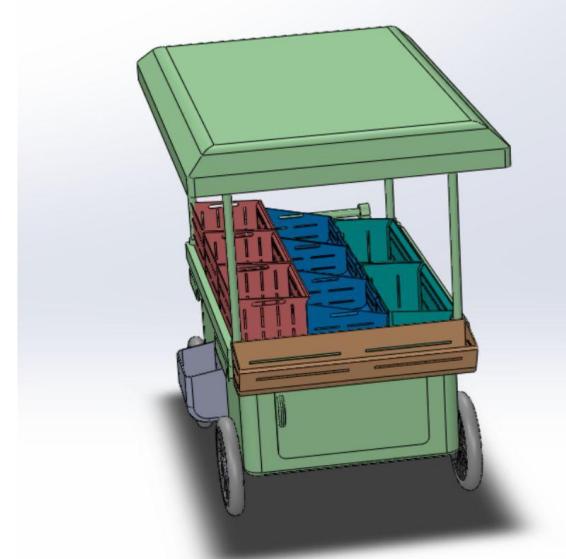
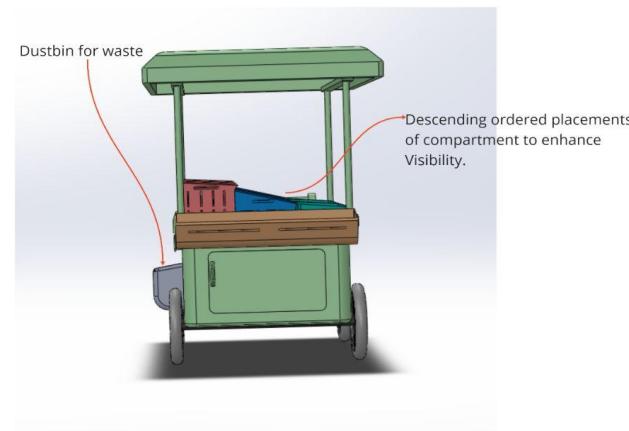
## 3d model exploration

An exploratory CAD model done in solidworks to identify the packaging of the , In this CAD model few features like storage for money, knife etc. being incorporated. Compartment for leafy vegetables and storage was also added in the model.





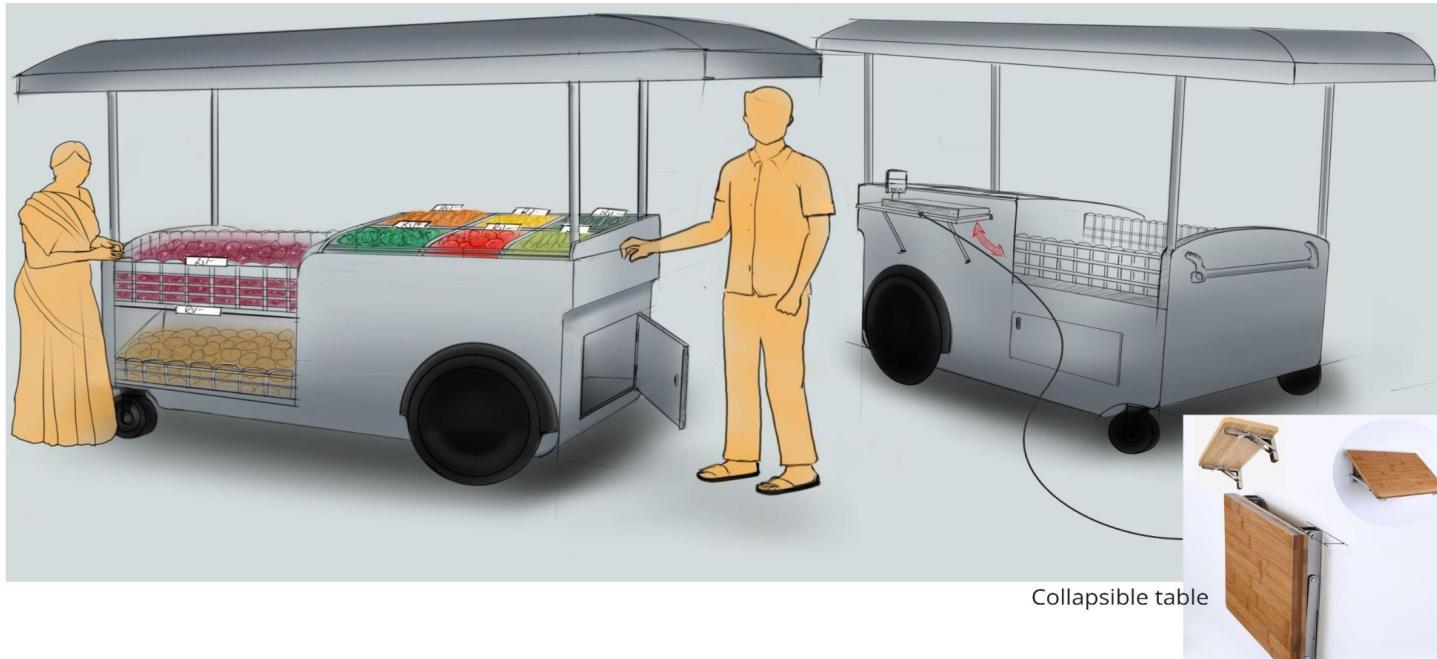
Two big compartments for whole season demanded vegetables (Potato, Onion etc.)



## 13. Final Concept



# Final Concept



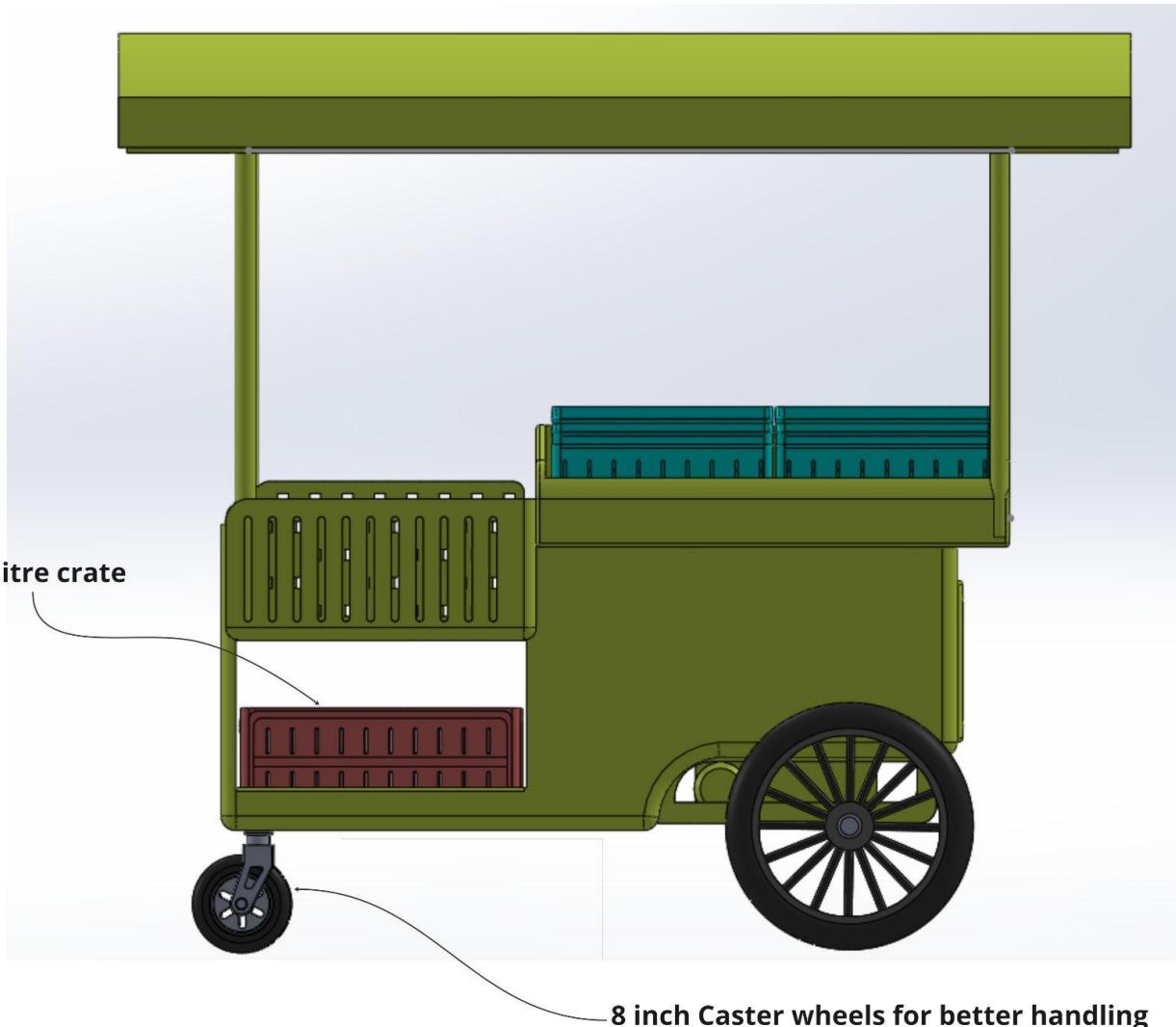
## Vendor

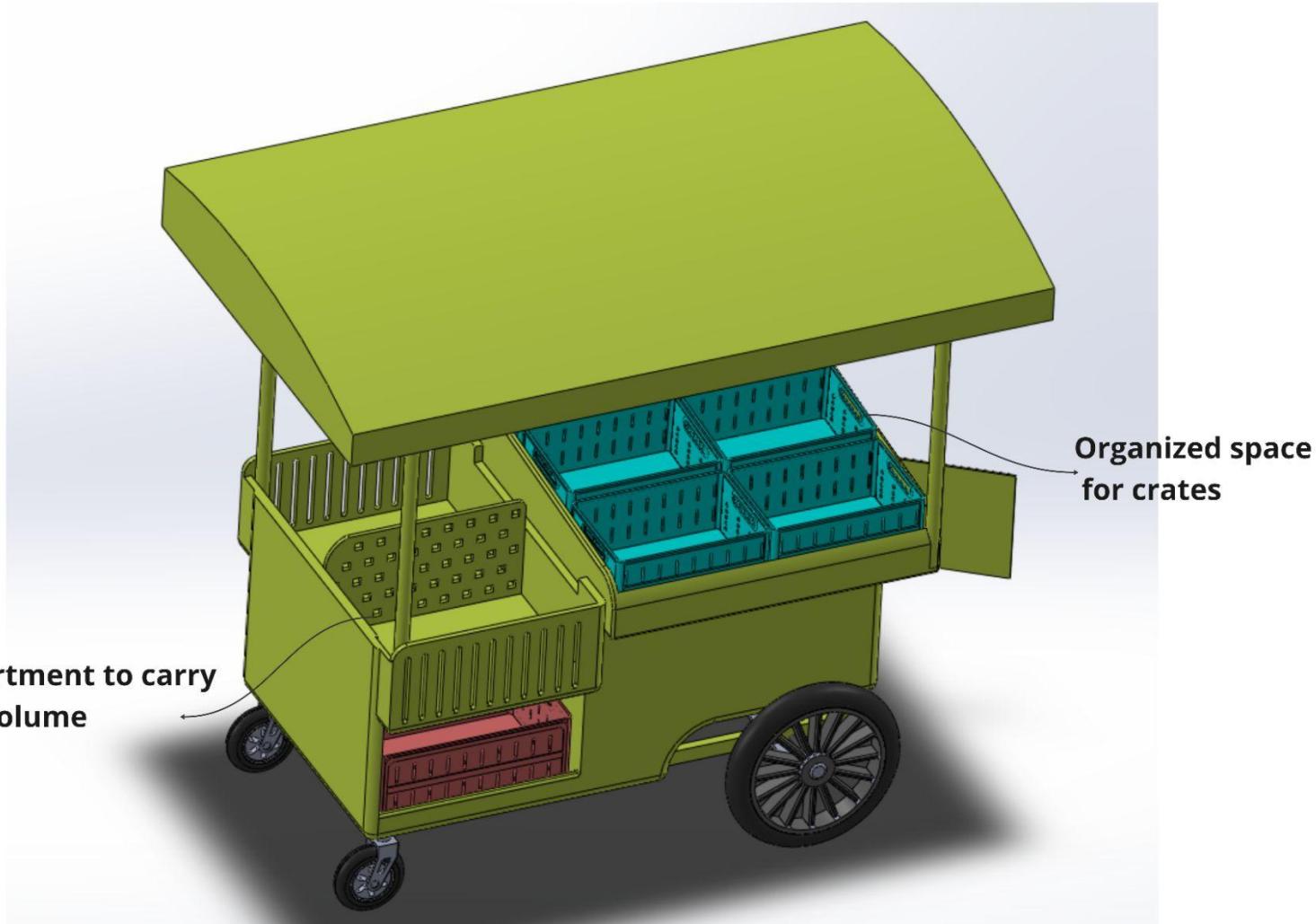
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Drivability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Access Space for packaging like stuff	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
Provision to weighing machine	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Access to carry more items	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>

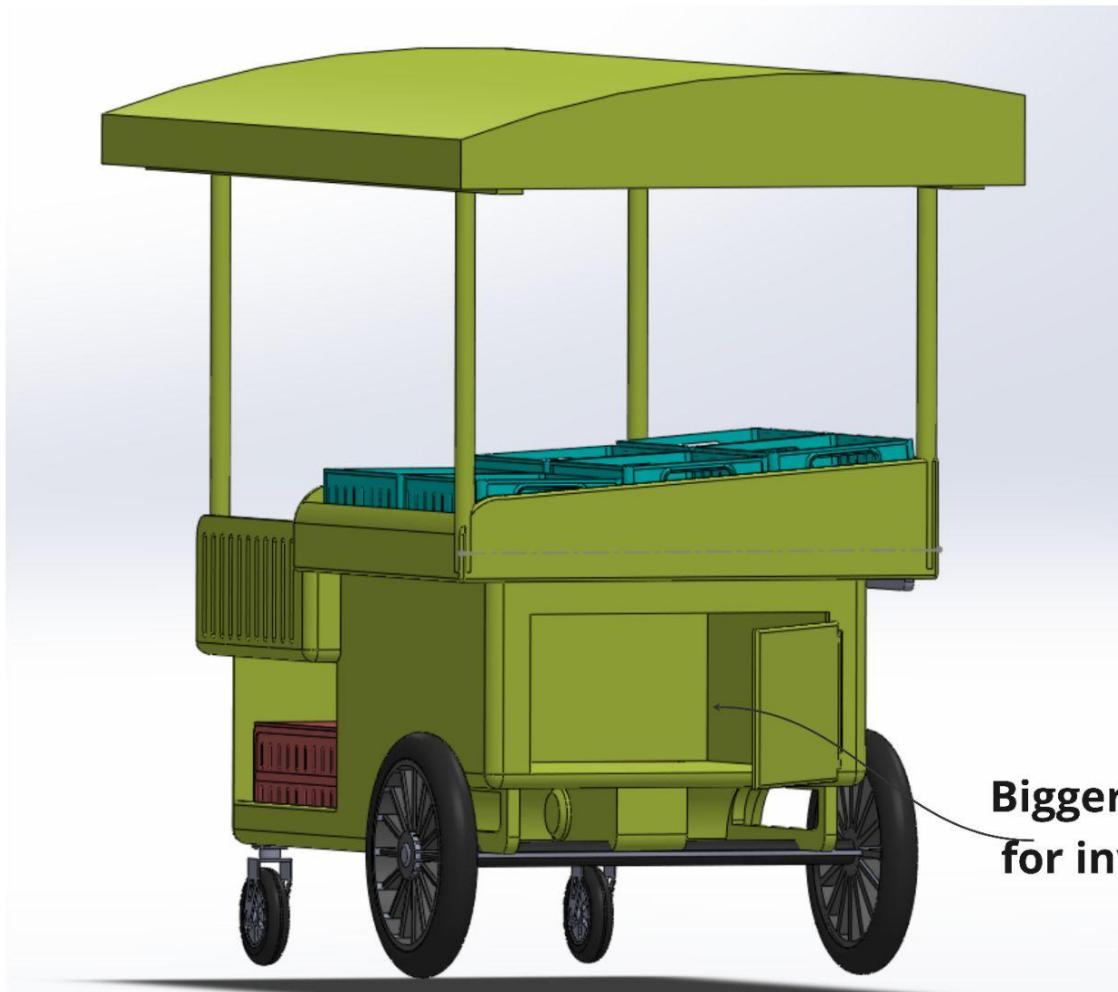
## Customer

Reachability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Price Tag	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Visibility	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Provision to Partitioned Item	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

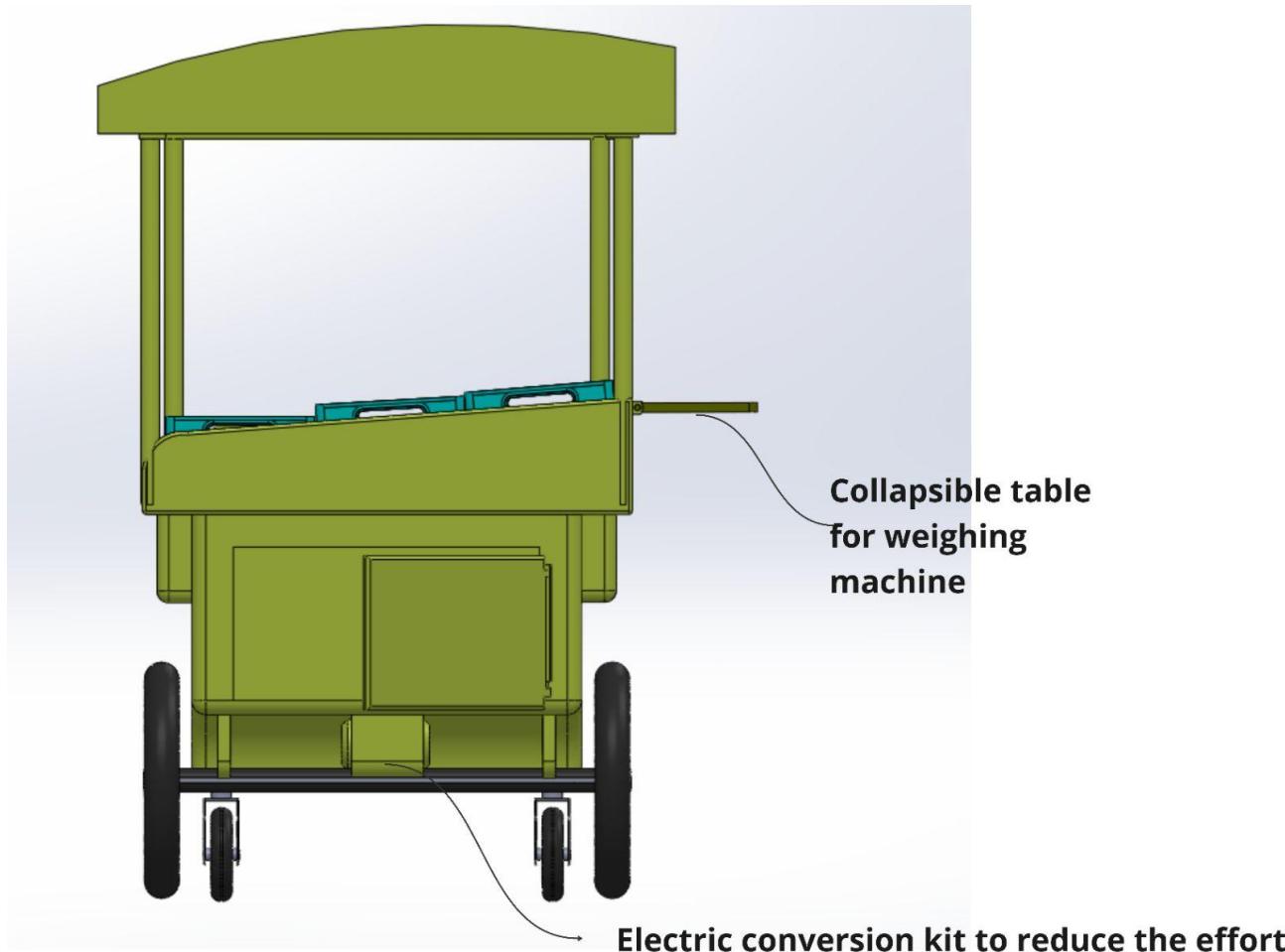
## 13.1\_Final Concept (3D Model)







**Bigger storage compartment  
for inventory**



#### Motor Details:

Rated Output Power - 350W. Rated Voltage - 48V DC.

Speed after Reduction - 480 RPM.

Rated Speed - 2800 RPM.

Gear Ratio - 1:6

## 13.2\_Final Render

The concept is being designed based on the issues that vendors are experiencing with the current vehicle (Fig.13.2.a).

1. New concepts have provision to carry more capacity with organized space , which was not there in existing carts.



Fig.13.2.a Final Render

2. Existing carts do not have any dedicated space for sitting , due to which the vendor has to remain standing which leads to musculoskeletal issues like disc issues. In view of this problem the new cart design has a collapsible chair which he can use when there is no customer.

3. New features like a money box and collapsible platform to place weighing machines are also being provided.

4. Every time when vendors need to turn their cart on , they have to lift the cart in doing so which has a direct impact on the wrist and which is not ergonomically unfit for them. To avoid such problems caster wheels are incorporated on the handling side of the cart.

5. Handlebars are also placed in horizontal orientation to reduce wrist damaging issues.

6. New concept has a larger storage compartment for inventory provisions.

7. It requires a larger force to push the cart when commuting , which somehow makes them stay at one place only. To reduce such efforts Electric motors are being incorporated into the wheels.



Fig.13.2.b Money Box

Money box to store money

Graphics are being provided on the

Either side of cart to make it visually More attractive

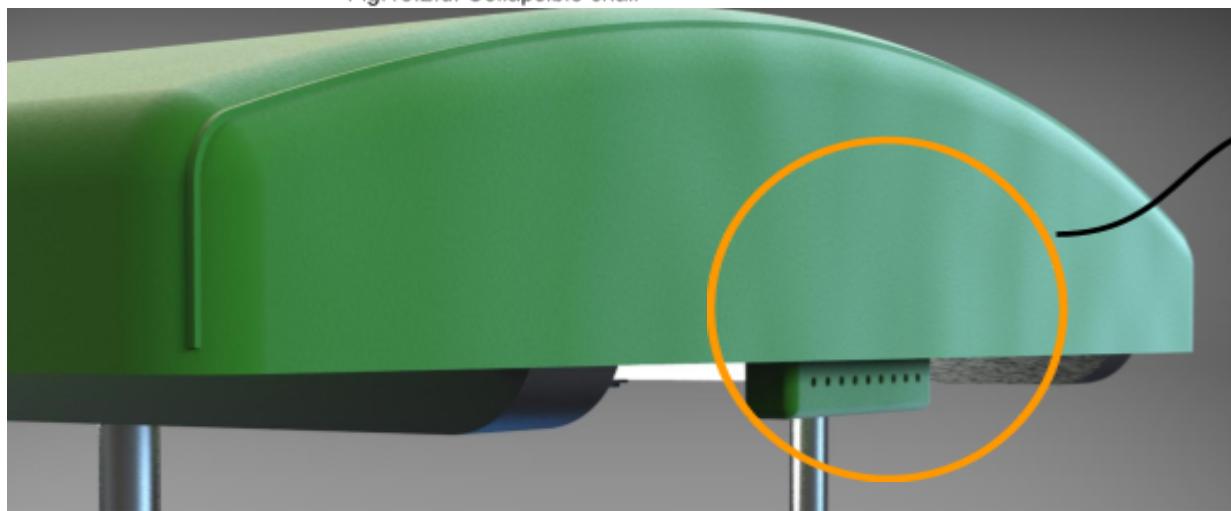


Fig.13.2.c Graphics on side panels



Fig.13.2.d. Collapsible chair

Collapsible chair



Incorporated speaker to announce the price of the vegetables

Fig.13.2.e

### 13.3\_Scenario Render



Fig.13.3.a Scenario Renderings



Fig. 13.3.b



Fig.13.3.c

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