COTTON PICKING
Design Brief

“Design a cotton picker that increases the efficiency of labourers in a cost effective manner while also reducing all sorts of problems faced by them while picking cotton.”
TIMELINE

- Design Brief
- Secondary Research
- Field Visit 1 & 2 (Empathizing with the labourers)
- Field Visit 3 (Empathizing with the farmers)
- Problem Definition
- Ideation
- Prototyping
- Testing
Secondary Research
Mind Mapping
Cotton Farming Process

Seed Sowing
After tilling the soil, the seeds (bought before) are sown in the land only after properly mixing it with the soil particles so that the seeds do not stick together.

Irrigation
Traditional variety of cotton is rainfed so not much water is needed for its optimum growth.

Weeding & Nurturing
Proper care of the plant is taken at all times and unwanted plants have to be removed by hands due to asynchronous growth patterns. Insecticides, pesticides & fertilizers are sprayed all over the field for protection.

Harvesting & Cotton Picking
By late Feb - early March, the cotton is ready to be plucked. At present, using traditional method, the balls are handpicked due to asynchronous growth patterns and stored in the traditional bags.

Stripping & Ginning
The cotton balls so picked are sold for stripping and ginning. In stripping, the cotton is separated from the ball and in ginning, the seeds are separated from the cotton.

100% Reusable Remains
the waste of the cotton balls is collected to be used as manure and the seeds are reused to extract oil and also sold for the next season. The branches left behind are used as fuel and the ashes that remain are used as manure.
Relevant Existing Technologies

**Hand Held Machine**
- Reduces effort
- Costly
- Not user friendly
- Awkward hand posture

**Harvester**
- High cost
- Unemployment of labour
- Not suitable for traditional cotton variety

**Natu Bhai’s Machine**
- Reduces efforts
- Can pick cotton only when completely dried
- Unemployment of labour
- Design not fool proof yet
Primary Research
EMPATHISING WITH THE FARMERS

- Finding labour is difficult and expensive due to set up of industries nearby
- The government is not farmer-friendly
- There was a clear divide between farmers whether they would be willing to purchase equipment for their labourers or not
Field Visit 3 - Panchasar & Juharpura

EMPATHISING WITH THE LABOURERS

- The labourers work from 8am to 12pm due to the heat in the afternoon.
- The traditional method of cotton picking and carrying puts a lot of pressure on the shoulders.
- The cotton pickers pick the cotton balls and put them in the bag behind them. The movement is repetitive and leads to fatigue. The cotton pickers usually carry a load of up to 10 kgs, and then empty it on a sheet and resume. Also, it involves frequent twisting of wrists.
Field Visit 3 - Panchasar & Juharpura
CONVERGING
Initial Problem Statement

“How might we create a set of cost effective tools that reduces body pain and protects the labourers (of any age or gender) from eye and hand injuries while ensuring a better collecting approach and device which minimises movements and body load while picking cotton.”
Ideations
Load Intense Distribution

The present collection method directly impacts the shoulders and waist as the labourers carry roughly 10 kg of weight about 10-12 times over a period of 4 hours. We have designed a belt with its strap around the waist and shoulders with the collection bags hanging on the waist belt which will distribute the weight all around the body.
Ripstop Gloves & Eyewear

We will use ripstop materials like nylon and polyester which are breathable and ripstop, that is, non-pierceable. This will last long and protect the labourers from hand injuries. At present, they simply use gloves costing Rs. 50 which lasts only 8-10 days, thus expensive and a deterrent due to regular investment. We can make scratch free glasses.

Bottom Cell Induced Head Wear

We will fit a torch getting power from a bottom cell which costs roughly Rs. 10-12. This will help the farmers and labourers to work at night as opposed to days. This will also solve the problem of lack of energy to work at night important for the jeera plant. At night, the farmers have to carry a pipe in one hand and a torch in the other and the coordination becomes very difficult. By introducing this head wear, we will be able to free up one hand.
Final Problem Statement

“How might we create a load distribution bag that is durable, a “Do It Yourself” product, increases efficiency and reduces body pain of labourers (of any age or gender) while collecting cotton and vegetables in a cost effective manner.”
Prototyping
First Prototype

We decided to go ahead with the load distribution bag and work on reducing body load.

We expect the bags to be able to carry 10 kg at least. If we find that our users are able to carry 10 kg without any fall in efficiency and lesser load on shoulders, we can try and increase the carrying capacity of the bag.

The presence of two bags to ensure both sides of the body carry weight equally.
Testing
Shortcomings

- Storage Capacity
- Restriction of Leg Movement
- Unloading Mechanism
- Imbalance While Walking Due to Two Bags
- Design and Product Appeal
- Cumbersome Wearing Process
Balanced Body Movement
Easier Wearing & Unloading Mechanism
Increase Capacity
Improve Design, Appeal
Prevent Hindrance to Leg Movement
Suggestions

- One Single Large Bag
  - Eliminates the Problem of Imbalance
  - Increases the Storage Capacity
- Less Cumbersome to Wear (Use of Buttons)
  - Provide Suitable Slope to the Bag
  - Does Not Hinder Knee Movement
  - Collection of Cotton Balls at the Back
- Improved Design
  - Button Based Unloading Mechanism

Less Cumbersome to Wear (Use of Buttons)
Second Prototype

- Increased the Capacity of Bag to 15 kg
- Does Not Hinder the Knee Movement
- Easy to Make and Wear
- Easier Unlocking Mechanism by Untying Knots
- Single Large Bag to Eliminate Body Imbalance
- Do It Yourself Product
Response to Second Prototype

- “Pehla ae loko jaahre cotton ball leta tha tyare tyoni kamar dukhti thi ane vadi jati thi parantu aa product thi tem ne tem na kamar na dukhama ane wahana dukhama ghado fer chhe.”

Earlier using traditional method, our back use to hurt a lot as we used to bend so often but with your prototype, our pain will be reduced.” - Bachu Bhai, 60 years old

- “Aa vastu ma sagvarta saari chhe. Hu darzi kaam kru chhu, hu pan aa vastu banavi ne aa loko ne aapis.”

- “This product has more space. It can carry greater volume of cotton. I work as a tailor and I will make more like these and give people for use.”- Rasu Ben, 47 years old
Universal Nature of Our Prototype

- Our prototype is not restricted to picking of traditional cotton balls.
- It can be used for picking vegetables and fruits that grow at heights like Apple Gourd (Tinda), Mangoes (Aam) & Ivy Gourd (Kundru).
- It can also be used for picking tea leaves which will reduce constant hand movements to the back.
We created DIY manuals for the cotton pickers to create the load carrying bags at home. The manual includes instructions in Gujarati, along with infographics for easy understanding. We have also included comparisons between the traditional method and the new design using body maps to show how our prototype is better than the traditional approach.
Thank you!