

DRS ONLINE FARMER'S MARKET

R Dakshina (19BCE1258) , Rahul Dakshnamoorthy (19BCE1339), Sandhya S (19BCE1614)

ABSTRACT

Farmers play an important role in the food value chain of India. The biggest obstacle in increasing farmers income in India is the profiteering middlemen. DRS Online Farmer's market is an interactive system where farmers can sell their produce at competitive prices and earn more profit and hence eliminate the role of middlemen. Farmers can market their produce in a way that it replicates a live market. An individual farm can also create online farm stores using our system. The customers can also purchase produce at cheaper rates and have wider choice. Customers are usually concerned about the freshness and quality of the produce. Our system offers image processing features to predict the freshness of produce using Machine Learning Algorithms like Siamese Neural Networks.

INTRODUCTION

Until recently, the growth of e-commerce has been driven by products such as clothing, digital goods and electronic appliances. Online Market for perishable fruits and vegetables is a novel concept as it connects local farmers and consumers. The biggest obstacle in increasing farmers income in India is the profiteering middlemen. Now, the COVID-19 pandemic has brought new risks that threaten farmer's livelihoods. Over the past month, organic and small-scale farmers have been struggling to find inventive ways to connect directly with customers and deliver produce to customers. Our system aims to connect the farmers directly to the consumers

without a middle man. The farmer can set the price of their own product. This way it will be very profitable for the farmer. The User Interface is farmer friendly and simple so that the farmer finds it easy to use. Our website will also show the farmer the average price of the products the other farmer sells and hence they can compete and earn large sums of profit. Our website is consumer friendly as well. We sort the farmers based on the farmer ratings which is decided by the quality of product which is determined by image processing. The factors which decides the ratings of the farmers also includes the star ratings given by the customer, price set by the farmer, the quantity of products produced by the farmer, shelf life of products and the location of the farmer with respect to the consumer.

The farmer can sell multiple products at the same time. There is a separate login for farmers. The farmer must add the product name, price, type of product, quantity of product and the image of the product. The image of the product uploaded by the farmer will be processed to determine the freshness and the shelf life of the product which will be a factor in determining the rating of the farmer. The farmer can also view his own catalog and add delete or edit his product details whenever necessary. The farmer can also view other farmer products and prices.

The consumer can also buy multiple products at the same time. There is a separate login for the consumers as well. The consumer can see the products menu where they can sort it by vegetables or fruit or sort by today's produce or a date. The consumer can also search for a farmer by his name and order his products. It's mandatory for the farmer to upload an image of the produce so that consumers can use this image for predicting the freshness of the produce. The consumer can also rate the farmer after receiving his order. The review given by the consumer is also one factor that determines the rating of the farmer. The consumer can further add the products to their cart and proceed to the payments. At the payment window a receipt will be generated and sent to the consumer and the farmer will also be notified when a product is being ordered by the consumer.

However keeping the consumer's privacy in mind we will not display any consumer details to the farmers.

LITERATURE SURVEY

There are other e-commerce websites that connect farmers and consumers but it works slightly differently. Several markets have been developed for direct farmer markets. Advantage of a farmer-specific website is that they improve sales, communication and delivery of produce to consumers. They are easy to implement and use. The prices are also lower and economically priced and farmers earn more profits. These websites integrate various components of a business administrative activities like inventory management, produce orders, produce labelling and analyzing a farmer's sales. These websites offer technical support to guide the local farmers. They have a good understanding about the producer's sales model and also have real-world farming experience.

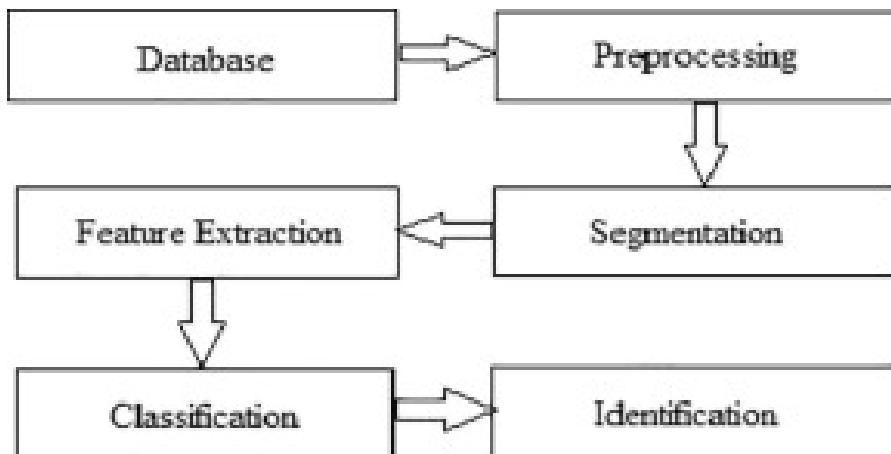
Our website uses image processing as a key aspect to predict the freshness of products that the farmer uploads. Research paper used as a reference [1] inspects the quality of fruits and vegetables. Image processing is also used for predicting the quality or freshness of products. Other methods such as

segmentation, UV-radiations, infrared radiations etc using an external device were also used to predict the freshness of a product.

Fruits and vegetable Freshness inspection [2] using image processing techniques

First step is pre-processing the image dataset which includes reshaping and converting images to grayscale. Next step is image segmentation [3] where images are partitioned into multiple segmentation to simplify the image analysis. Segmentation is followed by Feature Extraction. It is the process of reducing the dimensions of an image to

more manageable batches or groups for image processing. Features are estimated for further analysis. They are the basic factors in computer vision systems. They consist of image data for efficient image identification, interpretation and classification. The features of an image are extracted as image vectors. The main objective of this step is to increase the rate of image recognition by extracting valuable features from image. Color and texture are used to analyse the defects in fruits and vegetables. After Feature Extraction, the images are classified and the last step is Image Identification. The model will predict whether the image is fresh or bad.



In our project we have used image processing to predict the freshness of produce that the farmer uploads using a Custom vision tool which is explained in detail in the below section.

METHODOLOGY

3.1 CUSTOM VISION AI SERVICE

We are using Microsoft Azure Custom Vision AI Service. Azure Custom Vision is an image processing service that lets users build and deploy our own image recognisers. We use this service to build a model to compute the similarity between images to predict whether a vegetable or fruit is fresh or not fresh. The image processing uses TensorFlow tools and libraries. There are 5 images for each label in Custom Vision Project [4]. The images are classified as good or bad produce. Each produce has a total of 10 images under two labels (good and bad). There are two types of labels, good and bad for each product. There are a total of 62 labels and 31 products under our Custom Vision project. Next is the training phase. The image dataset is trained under 6 iterations with a Probability Threshold of 50%. Each label has a different precision percentage depending upon the images linked with the label. After training a quick test is done by finding the probability of

freshness of a produce. The model will predict the probability of freshness of the image under each label and sort it in descending order of probability.

Using Custom Vision's tools we have built a Tensorflow.js [5] model and incorporated it in our website. Now any consumer can predict the freshness of the product that they are trying to buy on our website under the predict freshness section.

3.2 DATASET

All the images fed to the image database are labelled as good or bad produce along with the product name. So, each image has a single label. For example, an image of a rotten lemon is labelled as "bad lemon" and an image of a fresh lemon is labelled as "good lemon". Each label has 5 images. Each vegetable or fruit has 10 images, 5 good images and 5 bad images. The image dataset is trained in six iterations.

Number of tags	Number of images per tag
62	5

Total number of produce: 31

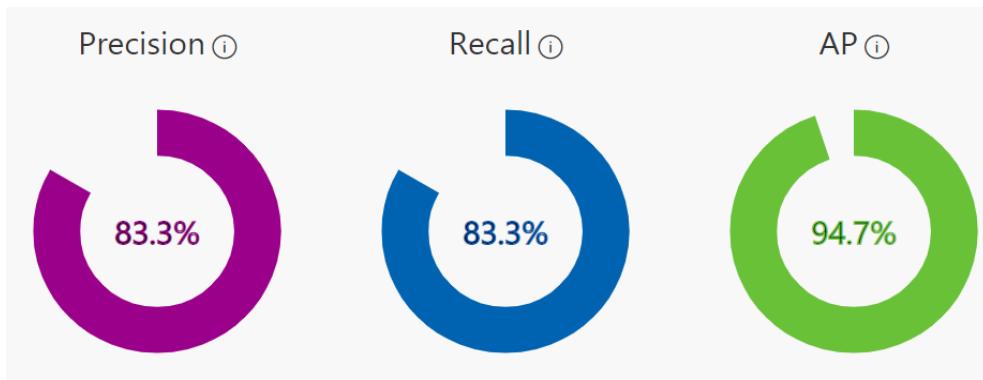
3.3 RESULTS

In the final iteration we achieve a decent accuracy and recall. We achieve a

precision of 83.3%. Precision tells us if a tag is correctly predicted by the model. So, our model has classified 83.3% of the tags correctly during the validation phase.

Recall tells us out of the tags which should be predicted correctly what percentage did the model correctly classify. Our model has achieved recall of 83.3%. AP which

stands for Average Precision summarises Recall and Precision at different Threshold. Our model has achieved an AP of 94.7%.



PERFORMANCE PER TAG

Tag	Precision	Recall	A.P.	Image count
good tomato	100.0%	100.0%	100.0%	5
good plum	100.0%	100.0%	100.0%	5
good pear	100.0%	100.0%	100.0%	5
good peach	100.0%	100.0%	100.0%	5
good papaya	100.0%	100.0%	100.0%	5
good mushroom	100.0%	100.0%	100.0%	5
good garlic	100.0%	100.0%	100.0%	5
good cucumber	100.0%	100.0%	100.0%	5
good corn	100.0%	100.0%	100.0%	5
good coriander	100.0%	100.0%	100.0%	5
good chilli	100.0%	100.0%	100.0%	5

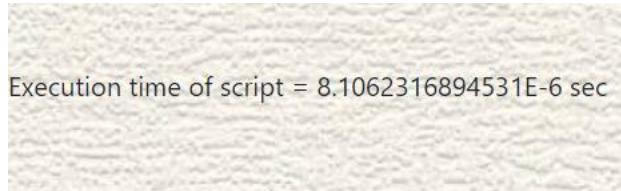
The model is then exported as Tensorflow.js and can be embedded in Farmer's market website to predict freshness of a product.

Time complexity

Time Complexity for our model is $O(n)$ where “n” is the number of labels used in Custom Vision tools. Since the probability

of all the labels are computed the time complexity is linear, that is $O(n)$. The space complexity is also in the order of “n” that is $O(n)$.

Execution time of script



Space complexity

27 requests | 71.1 kB transferred | 7.2 MB resources | Finish: 1.09 s | DOMContentLoaded: 572 ms

PRIMARY FEATURES OF WEBSITE

Features of our website are designed to replicate a live farmer's market. The system allows producers to easily access their online market and begin selling their produce to local customers. Markets can accept online credit and debit card or cash on delivery payments. Farmers can open their market and upload their available produce specifying prices and quantities.

Customers can browse the listed markets Our website contains several unique web page tabs for farmers and consumer

and purchase available products from the produce catalog. Throughout the buying period, farmers can update their product inventory, edit product image and upload new produce to the online market. When a customer places an order, respective farmers are notified regarding the purchase through an email. The customer also receives a mail about his or her order details and estimated time of delivery. Customer orders are delivered to the designated pick up location on the delivery day.

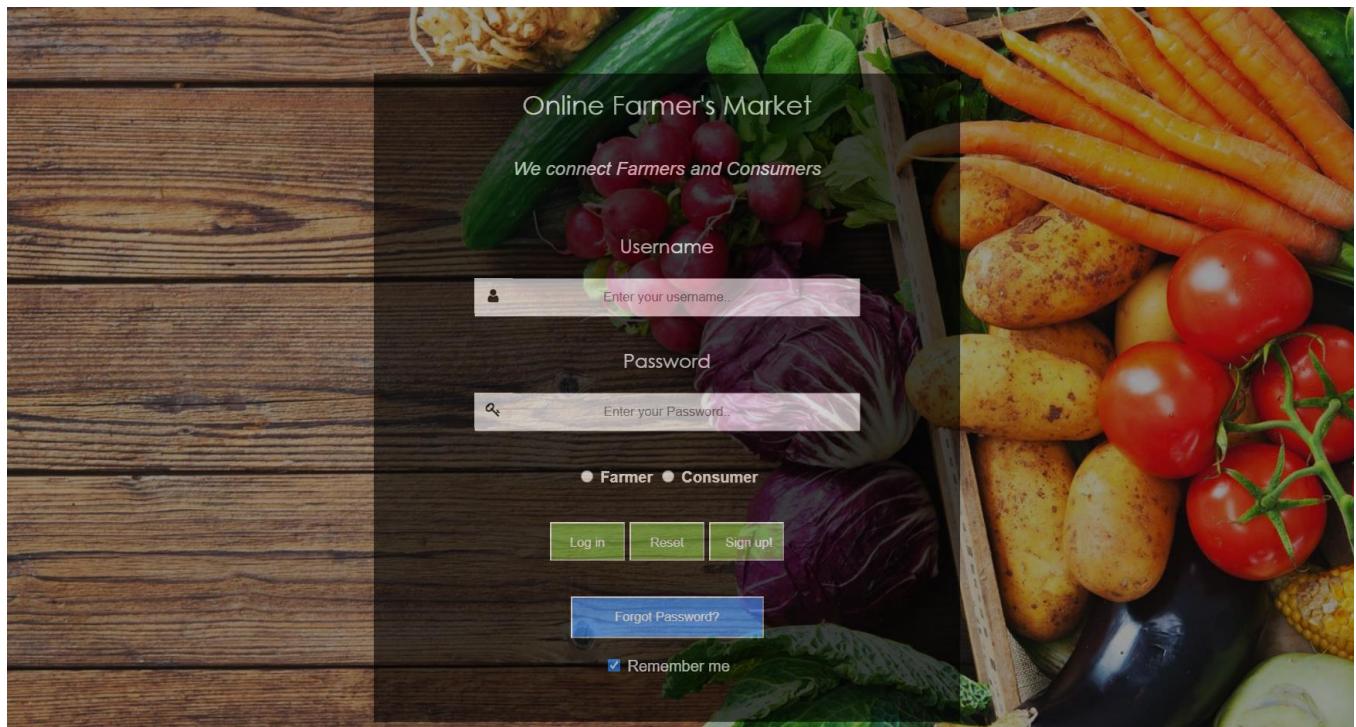
- Login
- Sign up

- Forgot Password
- Home
- Profile
- Our Farmers & Rating
- Catalog
- My Market
- Cart
- Payment
- About us
- Contact us
- Produce Freshness

Login

Login page is the first page that pops up for a user. Customers and Farmers can enter their username and password. If the user is a farmer, he needs to check the “farmer” radio button

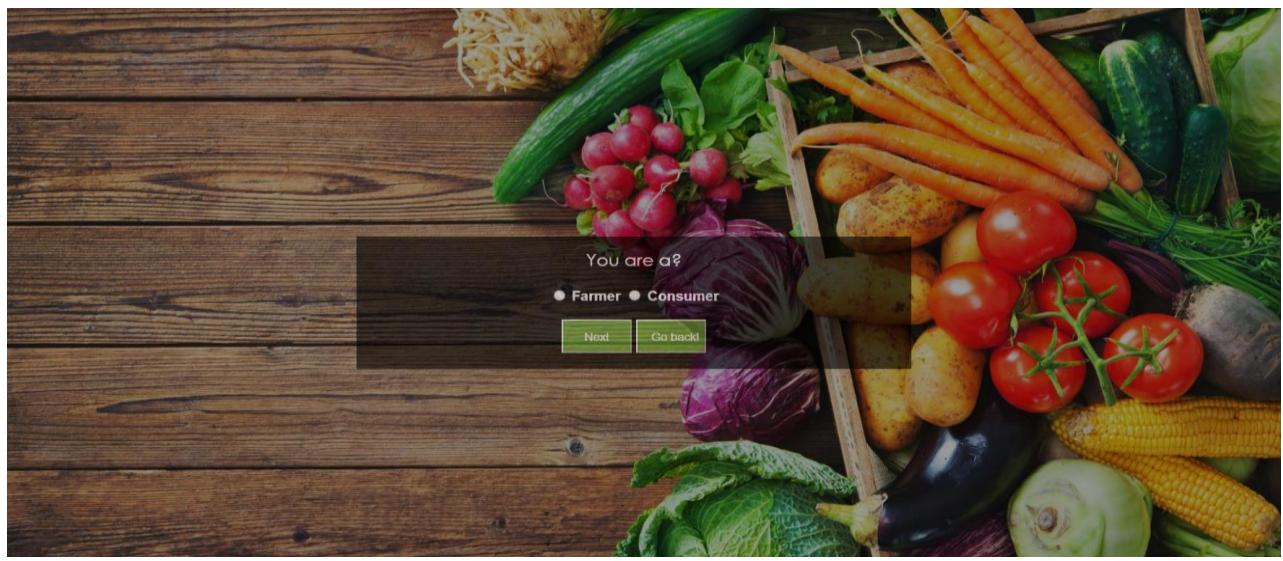
and if he is a customer, he needs to check the “consumer” radio button. After entering his credentials, the user can click the “Login” button. If the submitted credentials are right the user is taken to the DRS Home page.



Sign up

A guest can create an account as a farmer or as a consumer/customer. After clicking the “Sign up” button on the login page the user is taken to the next page where he needs to check either the farmer or consumer button to create an account. A Sign-up form pops up for the user to enter his personal information. Username

should not contain digits and password should contain at least one Capital letter and number and the length should be between 6 and 14. The entered “confirm password” should match with the password. The user can also upload an image as his profile picture.

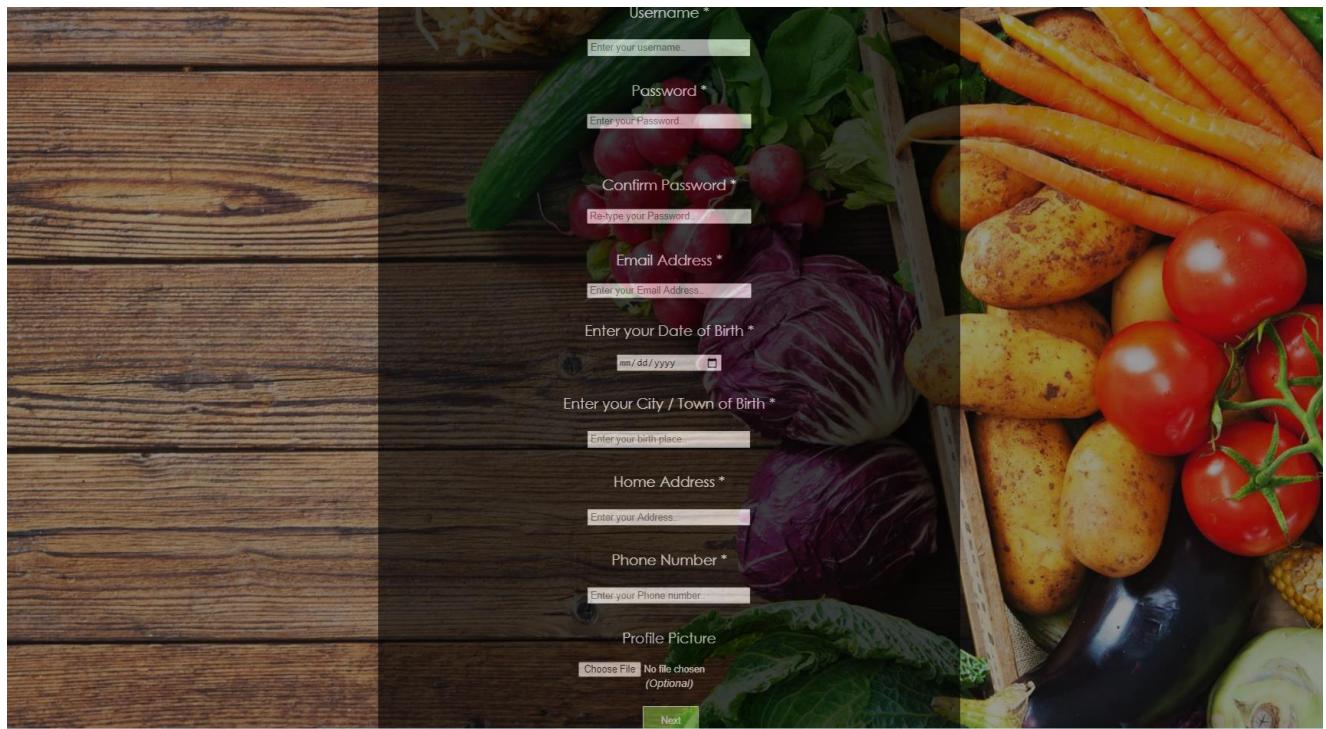


Farmer's account registration

The form fields are as follows:

- Username *
- Password *
- Confirm Password *
- Email Address *
- Date of Birth *
- City / Town of Birth *
- Farm Address *
- Phone Number *
- Profile Picture

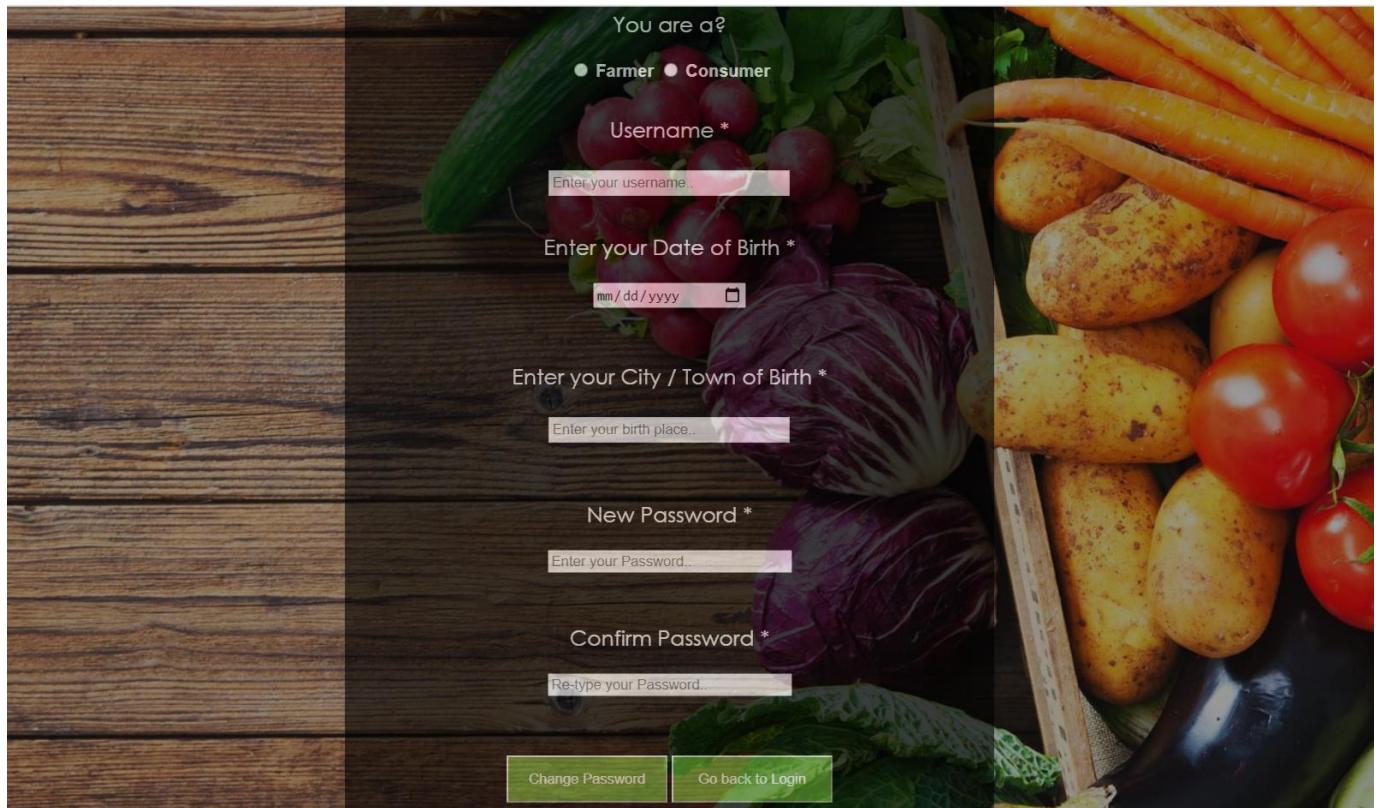
Consumer account registration



Forgot Password

The forgot password page is shown in the event that the user forgets his/her password and would like to set up a new one. This page is accessed through a button on the login page called “Forgot password”. Once the page is loaded a form is brought up for the user to fill where he/she enters details such as their user type (Farmer or Consumer), username, date of birth, and their city/town of birth. All these values together allow us to validate that the user is actually them and not one with malicious intent. Then the

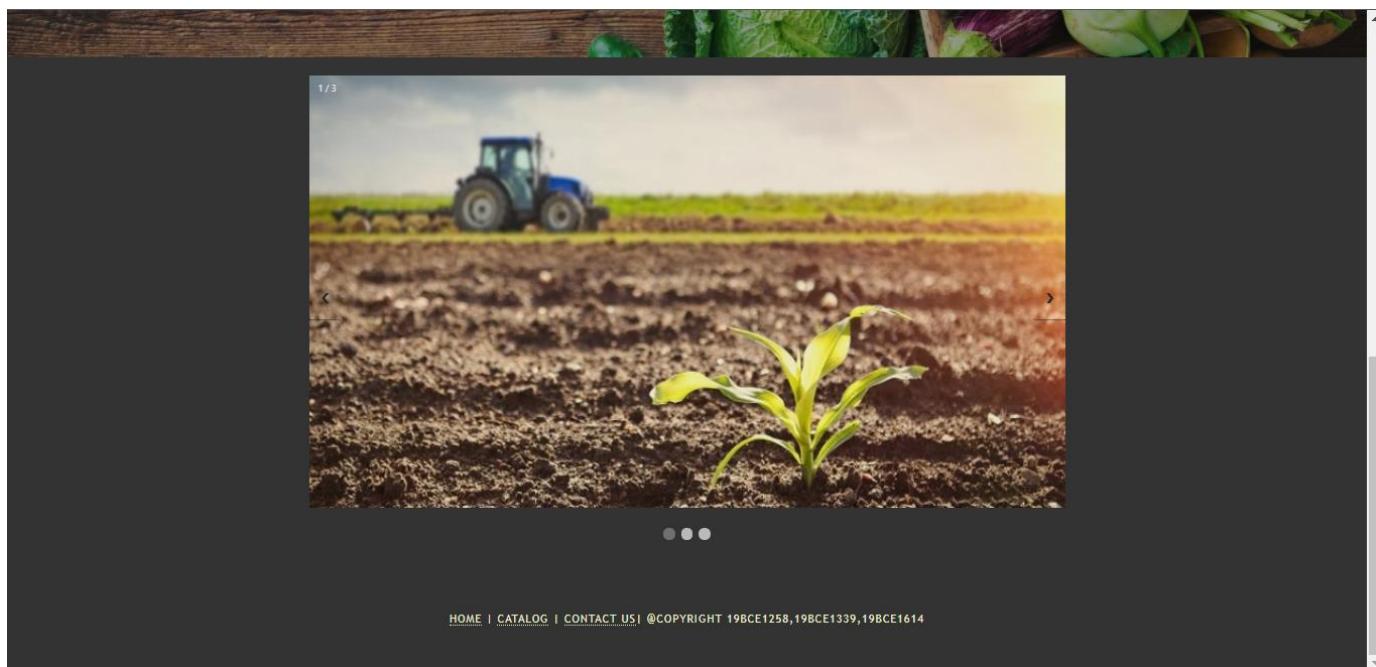
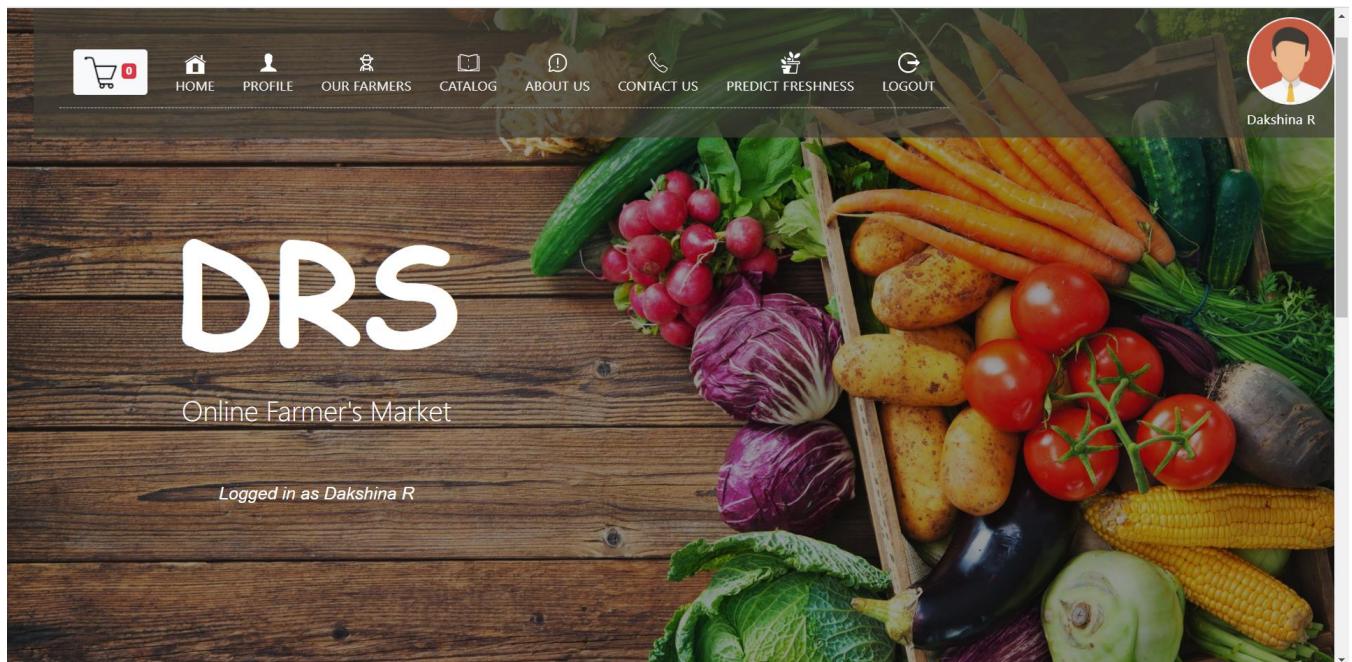
user is allowed to set up a new password and has to confirm the same password to prevent any misspelling or capitalisation errors before changing their password to the new one. Upon clicking “Change password” the new password is set to be their password to log in to the portal and use their account. The user can also go back to the login page cancelling their request to reset their password at any time by clicking the “Go back to login” button.



Home

The home page acts as the main hub for the website. It is the page the consumer/farmer is met with once they enter using the appropriate login credentials. This home page connects all the other modules at one place allowing the user to choose whatever module they want to access. The consumer has access to the modules they can use like cart, catalog to buy certain produce along with profile, contact us, about us, and logout.

The farmer has access to my market to change the attributes of whatever produce they put up already or if they wish to put up new produce. He/she is also shown the catalog module to check other farmers' produce along with the prices listed to give a baseline and something to compare their own prices with. The farmer also has access to the modules about us, contact us, profile, and logout.



Profile

Profile page is the area where both customer and farmer can view his personal details like Username, password, Phone number, registered address and

his current profile picture. The user can also update his profile picture. He can choose a new profile picture and click on Update button

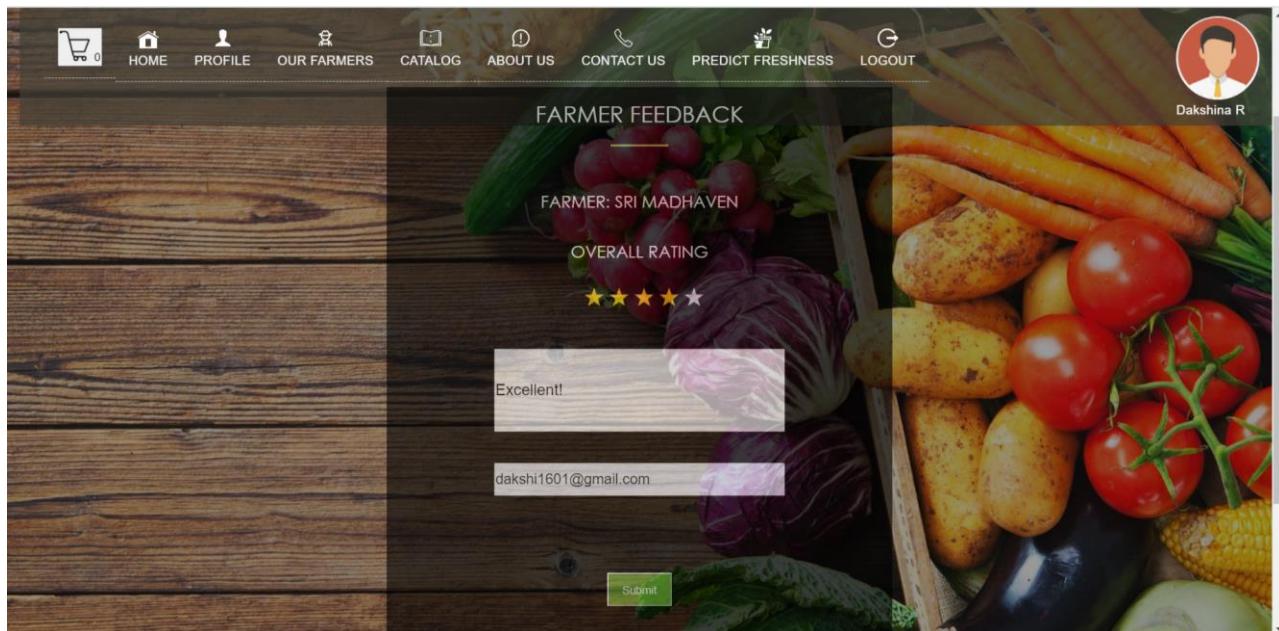
Our Farmers

Our farmers page is an area where all the registered farmers of the system are listed along with their name, profile picture, customer ratings and farm name. Customers can click on the “Rate me”

button next to a farmer to share their feedback and rate him based on their product quality. A customer can rate a farmer only once. As a farmer, he can't rate other farmers but can only view his farmer details.

Farmer Name	Farm Name	Rating	
Sushanth R	Birch Wood Farm		<button>Rate me</button>
Nathamayil Natesh	Magnolia Ranch		<button>Rate me</button>
[Redacted]	Whispering Pines		<button>Rate me</button>

Rating



Catalog

Catalog page is the area in which all farmer's active produce are displayed along with their description, price and quantity available. Customers purchase any product from the catalog. New and Featured Products are highlighted. The filters section allows the customer to group and organize products alphabetically, by item type (Vegetable or

fruit) and by date to facilitate the customer's shopping experience. Customers can also use a search bar to filter the products. Adopting a consistent naming system for product categories improves the customer's ability to find the desired products, which in turn could affect the number of products customers purchase.

Sandhya S

Catalog

Contains text..

Today's Produce 11-11-2020

Fruit  (17) Vegetable  (17) All 

1 2 3 4 5

 Banana Fruit © 2020-11-10 Farmer: Sushanth R Price : 30	 apple Fruit © 2020-11-08 Farmer: Sushanth R Price : 35	 Radish Vegetable © 2020-10-24 Farmer: Sushanth R Price : 55	 Spring Onion Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 45	 Red Cabbage Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 60
--	---	--	---	---

 Vegetable © 2020-10-24 Farmer: Sushanth R Price : 55 Available : 37 Quantity : <input type="text" value="1"/> 	 Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 45 Available : 99 Quantity : <input type="text" value="1"/> 	 Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 60 Available : 28 Quantity : <input type="text" value="1"/> 	 Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 40 Available : 100 Quantity : <input type="text" value="1"/> 	 Vegetable © 2020-10-24 Farmer: Naga Harshith Bezawada Price : 70 Available : 19 Quantity : <input type="text" value="1"/> 
--	--	--	--	--

 Chilli Vegetable © 2020-10-24 Farmer: Sushanth R	 Onions Vegetable © 2020-10-24 Farmer: Sushanth R	 Planktain Vegetable © 2020-10-24 Farmer: Sushanth R	 Peas Vegetable © 2020-10-24 Farmer: Sushanth R	 Spinach Vegetable © 2020-10-24 Farmer: Sushanth R
--	--	---	---	---

My Market (farmer)

Sushanth R

My Market

Add Produce Search.. Today's Produce

Fruit Vegetable All

Produce Image	Produce Name	Type	Date	Quantity	Price	Actions
	Strawberry	Fruit	2020-10-12	24 kg	Rs. 32	 
	Banana	Fruit	2020-10-12	25 kg	Rs. 54	 

	strawberry	Fruit	2020-10-24	40 kg	Rs. 60	 
	Raddish	Vegetable	2020-10-24	36 kg	Rs. 55	 
	apple	Fruit	2020-11-08	14 kg	Rs. 35	 

Your Market

Produce Name:

Produce Type: Vegetable Fruit

Produce Price (per kg):

Produce Quantity (in kg):

Image Of Produce (.jpg ,.png ,.gif formats only)

Choose File No file chosen

Item	Price	Actions
Rs. 32	<input type="button" value="Edit"/> <input type="button" value="Delete"/>	

Produce Image



Strawberry Banana Fruit 2020-10-12 25 kg Rs. 54

PAST ORDERS

Image	Customer Name	Item	Price	Quantity (in kg)
	Dakshina R	Beans	Rs. 16	2

Cart

The cart page is one which tracks all the produce items that the current consumer/user is willing to buy. It acts as a temporary list where the consumer can

add produce with varying quantities from the catalog page. The details of each produce item are shown such as the image, name, quantity, price and the

calculated subtotal based on the quantity. One can also remove a certain item from the cart which they added initially but are not interested in at the moment. There is also a clear cart button which removes all the items currently present in the cart. The payment amount is calculated based on

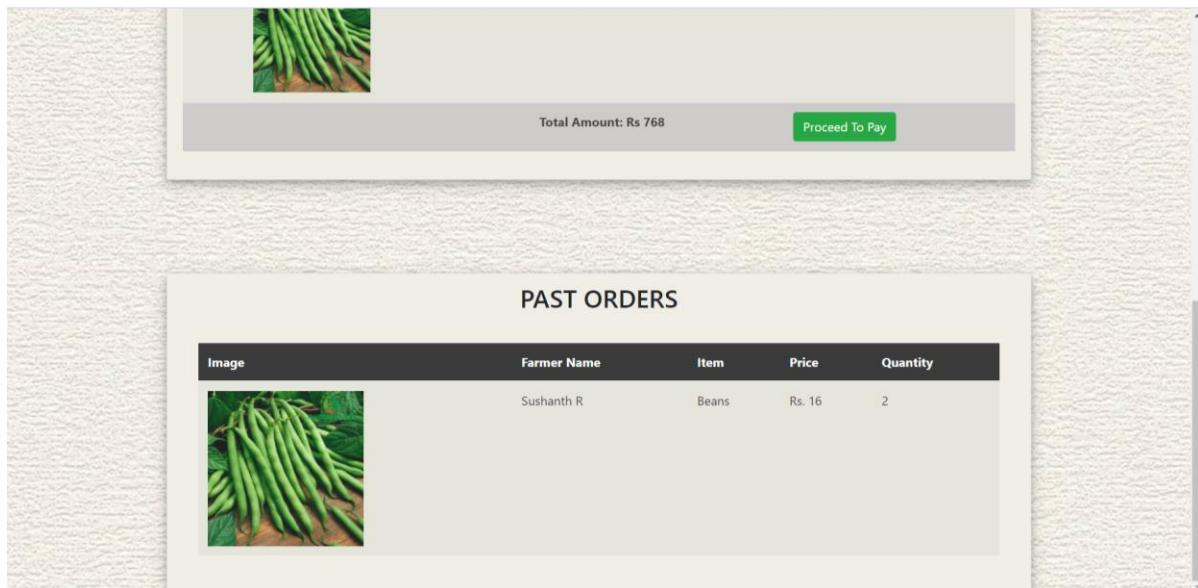
the individual prices of each item in the cart. Upon clicking the proceed to pay button, the items currently listed in the cart are confirmed to be bought and the consumer is redirected to the payment module.

No	Image	Item	Quantity	Price	Subtotal	Action
1		Radish	1 kg	Rs 55	Rs 55	<button>Remove</button>
2		Red Cabbage	1 kg	Rs 60	Rs 60	<button>Remove</button>
3		Blackberry	1 kg	Rs 300	Rs 300	<button>Remove</button>

	Red Cabbage	1 kg	Rs 60	Rs 60	<button>Remove</button>
	Blackberry	1 kg	Rs 300	Rs 300	<button>Remove</button>
	blackcurrant	1 kg	Rs 155	Rs 155	<button>Remove</button>
	Blueberry	1 kg	Rs 140	Rs 140	<button>Remove</button>

Total Amount: Rs 710 Proceed To Pay

Past Orders



The screenshot shows a mobile application interface. At the top, there is a header with a green bean image, the text "Total Amount: Rs 768", and a green button labeled "Proceed To Pay". Below this, a section titled "PAST ORDERS" displays a table with one item:

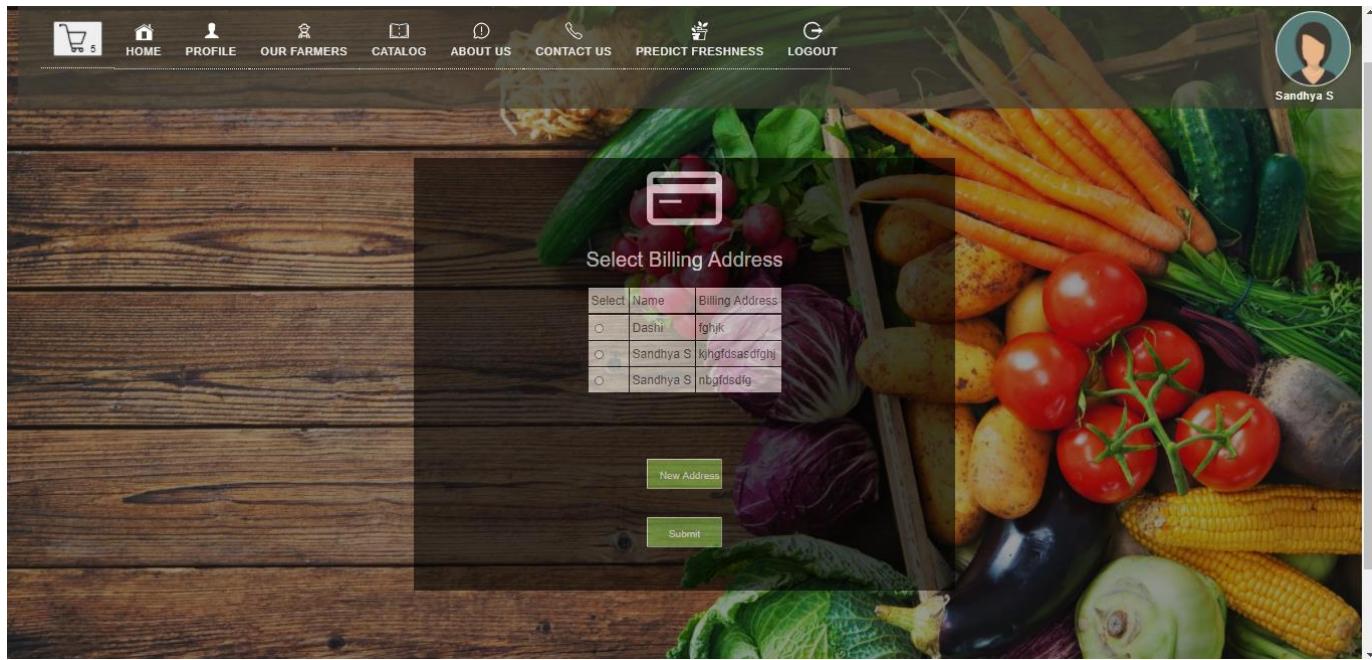
Image	Farmer Name	Item	Price	Quantity
	Sushanth R	Beans	Rs. 16	2

Payments

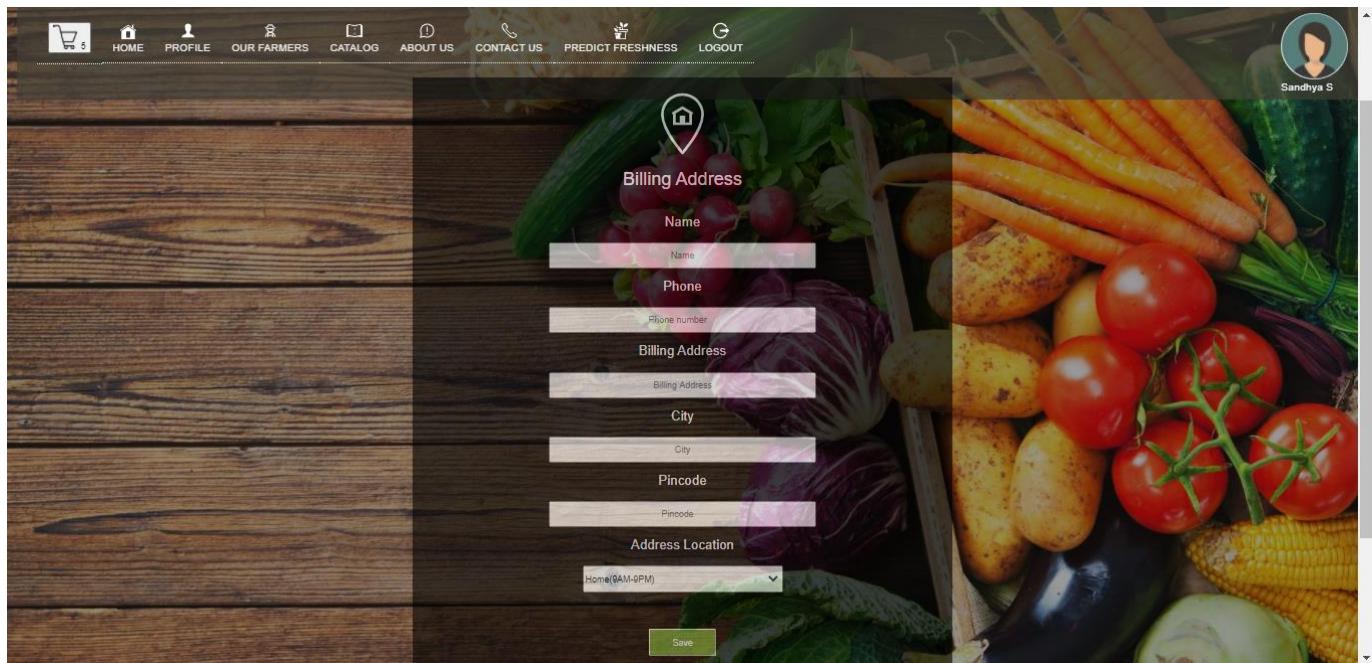
Once the user clicks on proceed to pay on the cart the website gets redirected to the select billing address page. The consumer can either select the previously used address or can add a new address and use that. Once the address is selected the user has to click on the submit button which will redirect the consumer to the payment portal page where the user can choose their comfortable payment method. If they choose card payment, they can choose to select a card which they have already used or can add a new card and hence use that to proceed with the payment.

Once the card is selected the website redirects to the confirmation page where the name of the user, their billing address and the total amount is displayed. If they have chosen the card payment method then the card number is also displayed in the confirmation page. The website asks the user to enter the CVV of the card to validate the identity of the card holder. Once a correct CVV is entered the payment process prompts a success window. If the CVV is incorrect the page prompts CVV did not match and redirects back to the cart page.

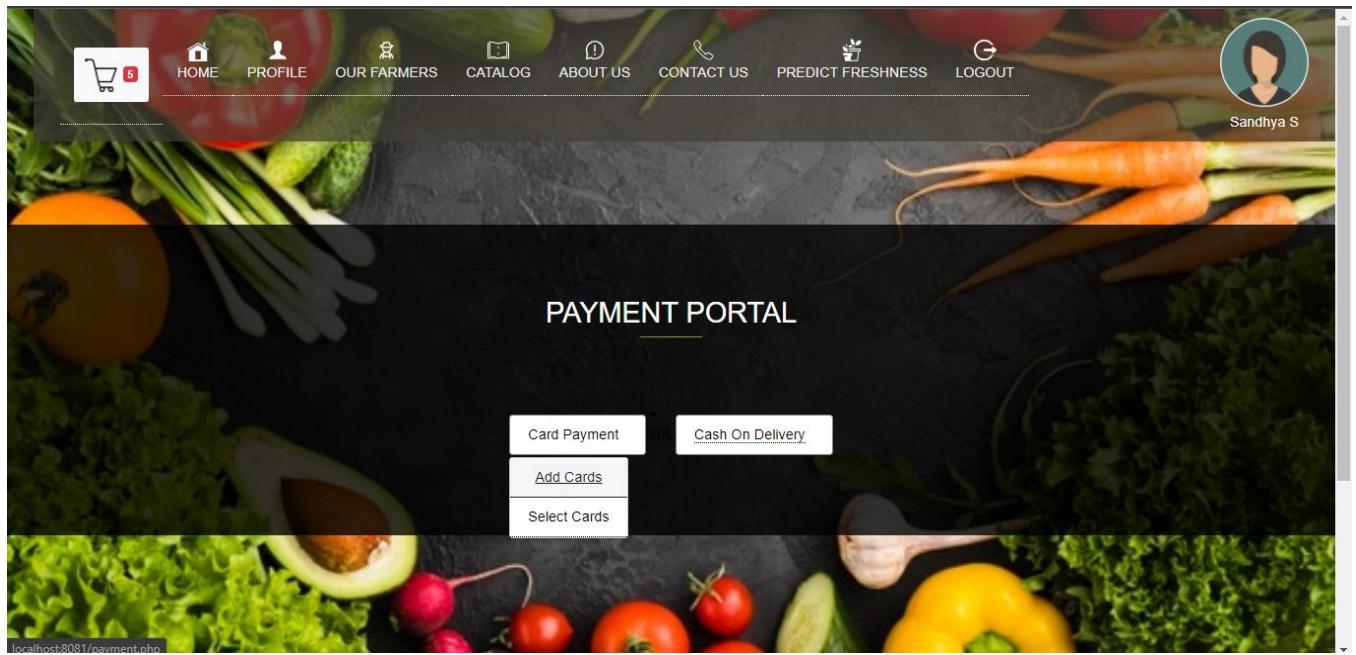
Select Billing Address



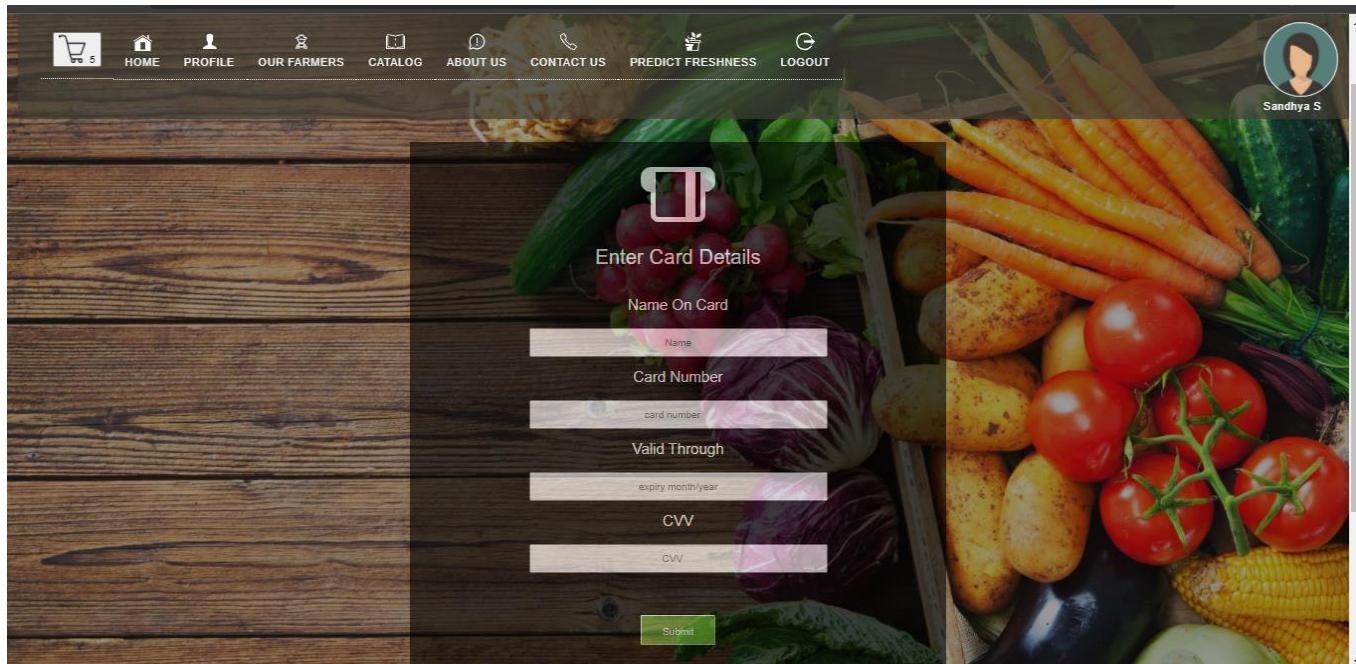
Add Billing Address



Choose Payment Method



Add Card



Select Card

Select	Name On Card	Card Number
<input type="radio"/>	BHUVANA	1234567890987651
<input type="radio"/>	BHUVANA	1111222233334444
<input type="radio"/>	Sridhar	1122112211221122
<input type="radio"/>	Sridhar	5555666677778888
<input type="radio"/>	BHUVANA	9999999999999999
<input type="radio"/>	Sandhya S	8787656554544343

Confirm Payment through Card Payment Mode

CONFIRM NOW

USERNAME: SANDHYA S

BILLING ADDRESS: KJHGFDASDFGHJ

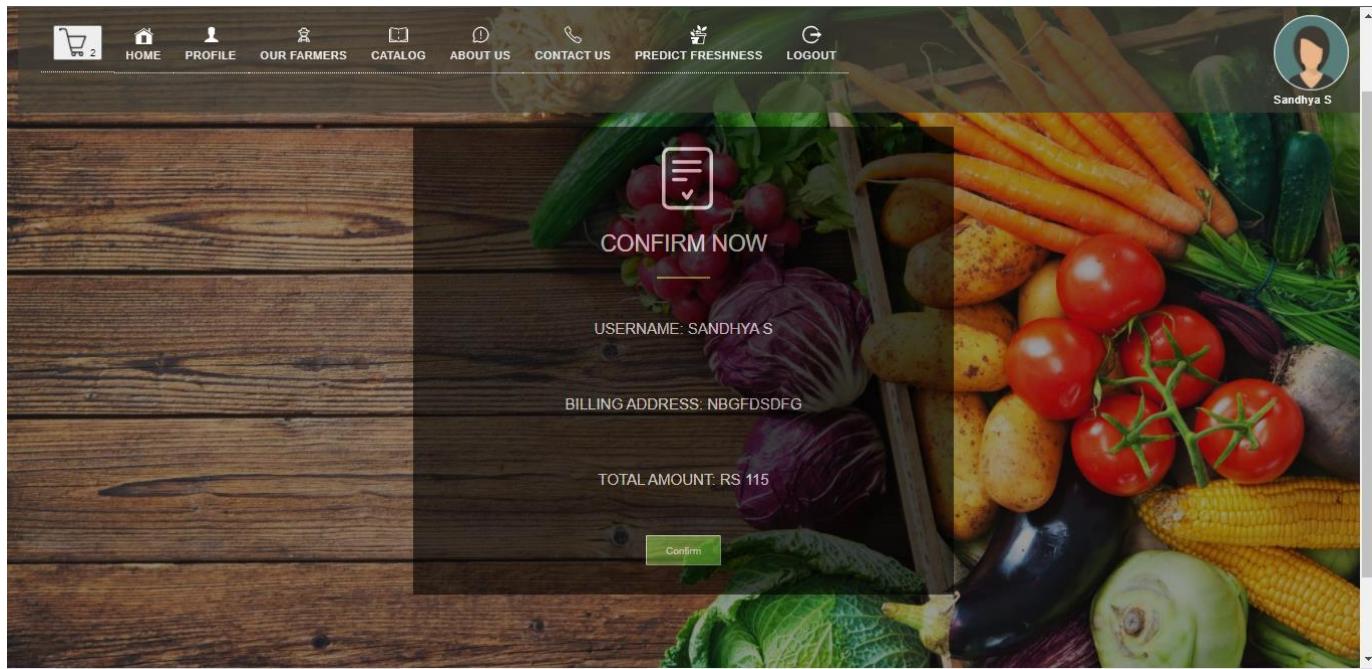
CARD NUMBER: 8787656554544343

ENTER CVV

TOTAL AMOUNT: RS 710

Confirm

Confirm Payment through Cash On Delivery Mode



About us

The About us page is the space where information about the website is provided. It includes our vision statement, mission statement, pictures, market signup instructions for customers, and details about online ordering. The about us page informs the user about the

principles upon which the site was created. It shows them the intentions of the creation and the problems that are aimed to be solved using this site. The vision of this project is given along with the freedom offered to the users by the site's various functionalities are listed.

ABOUT US

We connect Consumers and Farmers

OUR VISION

Smallholder farmers are a crucial part of the food value chain in India. Now, the COVID-19 pandemic has brought new risks that threaten farmer's livelihoods. Over the past month, organic and small-scale farmers have been struggling to find inventive ways to connect directly with customers and deliver produce to customers. We are working to empower the small scale and local farmers and offer a new sales and communications channel that allows consumers to access quality alternatives whilst supporting their local community and keeping green.

About us Slideshow

find inventive ways to connect directly with customers and deliver produce to customers. We are working to empower the small scale and local farmers and offer a new sales and communications channel that allows consumers to access quality alternatives whilst supporting their local community and keeping green.

CHARACTERISTICS

The farmers set their own prices
The system is designed to replicate a live farmer's market. The customers are buying directly from the farmer, at prices set by the farmer. The farmer describes what is available, supplies photos of the produce, and sets the selling price.

The customer has choices
Just like at a traditional farmers' market, the customer can browse everything that is available from all of the different farmers. The customer can choose exactly what to buy, how much to buy, and from what grower to buy.

The customer has time to decide
Unlike a live farmer's market that may be only open for a couple hours with all the good stuff gone soon after opening, here markets are usually always open. Customer have ample time to browse the catalog and plan menus for the week.

Payment is taken or cards get charged when the orders are picked up
Most markets will have a payment terminal or location for customers to make up their orders. Payment can be made with cash or card.

Contact us

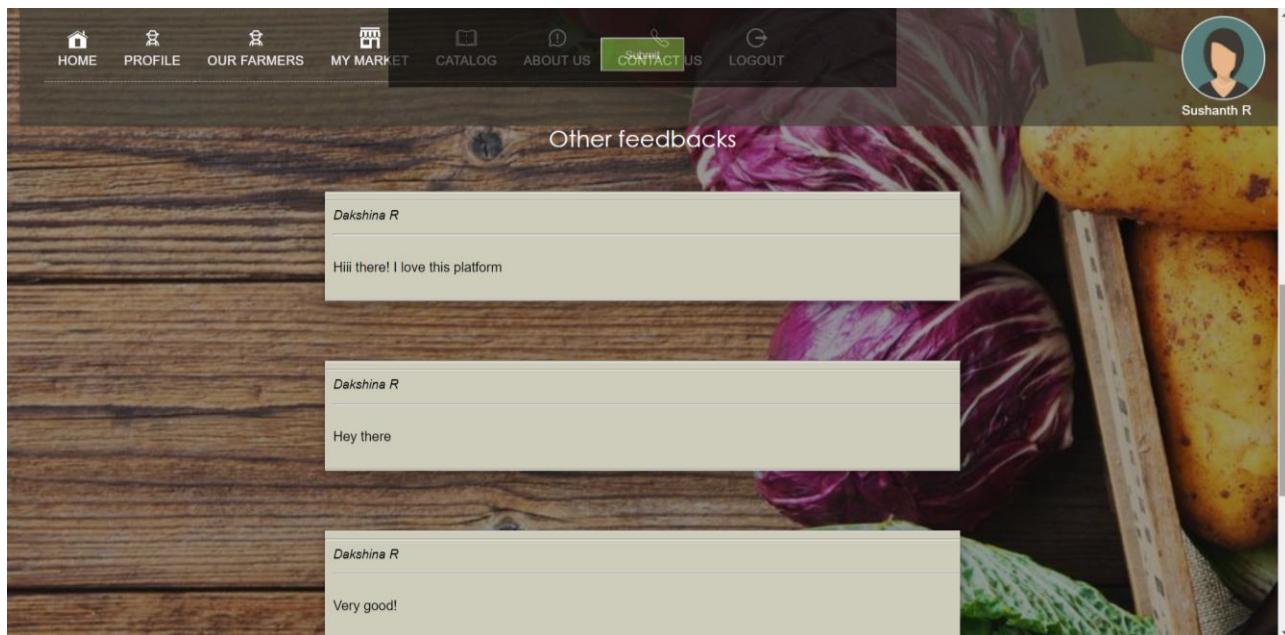
The contact us page provides the user with a contact form with fields like name, email, phone, comments which upon entering, are stored in the database which the admin reads and contacts the

user through the email entered. This could be a general query or regarding an issue or anything else that the user needs assistance with.

Enter Your Feedback

Name
Email address
Phone
Comments

Submit



Produce Freshness

Our Website has a unique feature to predict the freshness of a product. The model is loaded to the page when the user navigates to the Prediction page. The user

can upload any image of a product sold by a farmer. After uploading the image, the user has to click on the Predict button. The Machine Learning Model predicts whether the product is "bad" or "good" along with its probability.

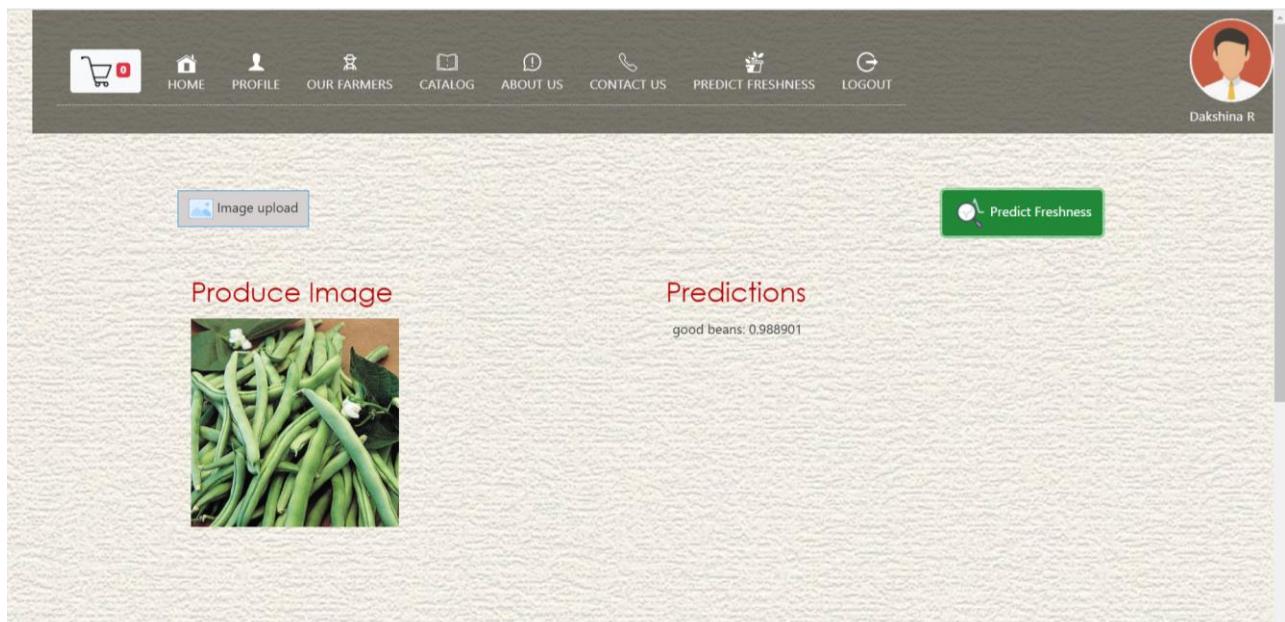


Image upload

Produce Image

Predict Freshness

bad capsicum: 0.980658

Dakshina R

Image upload

Produce Image

Predict Freshness

bad cauliflower: 0.826813

Dakshina R

CHARACTERISTICS

Farmers can set their own price for their product:

The system is designed to replicate a live farmer's market. The customers are buying directly from the

farmer, at prices set by the farmer. The farmer describes what is available, photos of the produce, and sets the selling price.

The customer has a choice:

Just like at a traditional farmers' market, the customer can browse everything that is available from all of the different farmers. The customer can choose what to purchase, quantity of the produce in kilograms, and from what farmer to buy.

The customer has time to decide:

Unlike a live farmer's market that may be only open for a few hours with all the fresh produce gone soon after opening, here markets are usually always open. Customers have sufficient time to go through the catalog and plan their menus for the week.

Payments can be made through credit or debit card or by cash on delivery.

Most markets will have a set pick up location for customers to pick up their

orders. Payment can be made when the order is placed through the website or can be made when order is picked up by the customer (cash on delivery). Change in the amount owed for an order will be a common occurrence. Maybe it's because produce ran short due to bad weather, or maybe there were extra items available on the table when the customer placed an order, or maybe the farmer decided to adjust the price. The system helps customers keep track of all the changes so everyone gets charged the right amount.

Monthly and Weekly Reports for Farmers

Farmers can view monthly and weekly reports on number views on his profile and past orders.

CONCLUSION

DRS Online Farmer's Market is one of the e-commerce systems options that enables individual farmers to create online local food markets. With the development of this system, farmers can market their produce to local consumers, who search for and purchase produce through the online markets. The system is built to empower the small scale and local farmers and offer a new sales and communications channel that allows consumers to access quality alternatives

whilst supporting their local community and keeping green. The system benefits the farmer with its feature which allows the farmer to fix their own price for their produce. The consumers are also benefited by this system since they can test the freshness of the products, they are willing to buy beforehand and also, they can purchase the produce according to their budget.

REFERENCES

- [1] [Fruits and vegetables quality evaluation using computer vision.](#)
- [2] [Image Processing Technique](#)
- [3] [Image Segmentation](#)
- [4] [Custom Vision tool](#)
- [5] [TensorFlow](#)