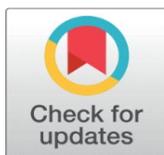
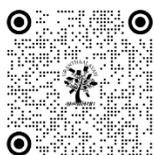


DESIGN AND DEVELOPMENT OF STUBBLE SELLING AND ASSISTANCE APPLICATION

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ABSTRACT

Every year, Punjab and Haryana burn between 15 and 20 million tonnes of crop residue, the majority of which is rice straw. Agricultural burning produces a large amount of smoke quickly. Delhi's air pollution levels during Punjab's busiest crop-burning season are 20 times higher than what the World Health Organization considers to be safe (WHO). Many states forbid burning of stubble, and some farmers have even been detained as a result. However, they do so because they have a short window of time between the paddy crop's harvest and threshing, and the wheat crop's field preparation and planting. Therefore, to provide a one stop solution to stubble burning, a platform where businesses that buy stubble can be connected can be farmers that sell stubble. Additionally, if the farmers are unable to sell the stubble, they can connect them with NGOs or agricultural institutes that can provide better solutions depending on type of crop, soil, etc. In this way, it will help farmers in generating additional income and can also improve quality of air.

Keywords: Stubble, NGOs, WHO, pollution, GHGs

1. INTRODUCTION

The Indian economy's ability to grow and develop sustainably has always depended heavily on the agriculture sector. High yielding variety (HYV) seeds were introduced into the system during the Green Revolution, greatly enhancing farmer productivity, cropping intensity, and per capita income. This led to the adoption of a wheat-rice cropping pattern by farmers, which led to the unsustainable exploitation of natural resources like soil, water, and forests. Farmers burn the stubble of their crops because there is not enough time between the harvest of rice and the planting of wheat. The burning of this valuable raw material releases hazardous particulates and greenhouse gasses (GHGs). It emits 70% carbon dioxide (CO₂), 7% carbon monoxide (CO), 0.66 % methane (CH₄), and 2.09% nitrous oxide (N₂O) and has a detrimental effect on both human health and the quality of the air and soil. The strength of the particulate matter released while burning varies according to the age range of the persons it affects. Children's bodies are less robust, which causes them to breathe in more PMs, which raises their respiration rate over that of other age groups.

Stubble is utilized as a raw material in a number of industries, including paper, biofuel, and packaging. Farmers cannot sell their crop residue in an organized market, nor can they access a website that provides aid for the disposal of crop residue. Therefore, a platform that can act as a marketplace for farmers to trade agricultural waste and get aid with crop disposal is required.

2. LITERATURE REVIEW

Authors, in the paper [1] emphasized on environmental and health hazards due to stubble burning in Punjab. The paper throws light on the current situation of farmers and reasons why they resort to this method. It also discusses a few alternatives and schemes offered by state and central governments. In the paper,[2] the authors have mainly focused on the reasons why farmers have to burn the stubble and how the problem arises due to the use of mechanized harvesting which leaves several inches of stubble in the fields.

In the book,[3] the authors have given a detailed study about the impacts of burning stubble. This paper offers several additional applications for crop residue. By comparing the amount of cereal crop residue produced and burned in different North-West Indian states in 2008–2009, the author [4] has investigated the situation of crop residue burning. In order to stop this problem, it also makes recommendations including using stubble in the paper sector, electricity generation, and farmer education.

The authors of the paper [5] argue for improved harvesting procedures and sustainable management of RWS as they describe how residue burning results in nutrient and resource loss and negatively impacts soil qualities. The causes of stubble burning and its consequences are discussed by the author in the paper [6]. It also covers several solutions that might be used to lessen stubble burning.

On their study [7], the authors describe the management of crop residue in the Indo-Gangetic plains.

Moreover, how crops are raised utilizing zero tillage techniques to enhance soil quality.

In the paper,[8] author puts forth literature on various aspects of residue generated on the field, chemical composition of the residue, volume of pollution caused by residue burning, adverse impact of burning on human and animal health and various ways of crop stubble management. In the article,[9] author calls the attention of lung specialists, public authorities and the community in general to the health risks entailed in the burning of biomass, be it indoors or outdoors to which the population is exposed.

The paper's [10] authors looked at several tillage techniques, including the Happy Seeder (HS), which can seed wheat directly into significant volumes of crop residue, and assessed the effect on wheat yields and production costs. The authors urged stronger enforcement of the restriction on residue burning and listed the personal and societal advantages of employing zero tillage techniques.

The authors of the paper [11] give a description of the burning of agricultural crop residue in Punjab during the growing seasons of the wheat and rice crops. Data collected between May and October 2005 by the Indian Remote Sensing Satellite (IRS-P6) Advanced Wide Field Sensor (AWiFS) have been evaluated to determine the extent of burnt regions and, consequently, the greenhouse gas (GHG) emissions from burning crop residue.

Results indicated that emissions from residues of the wheat crop. The authors of the paper [12] explain how the farmers were forced to burn the stubble due to increased mechanization, such as the use of combine harvesters, and the lack of an economically feasible alternative. This causes abrupt environmental effects due to an increase in ambient air pollution levels.

Table 1 Literature Survey Table

Sr no.	Title	Year of Publication	Findings	Gap Identification

1	Changing agricultural stubble burning practices in the Indo-Gangetic plains: is the Happy Seeder a profitable alternative?	2021	This is an analytical paper where the authors have examined different tillage practices like Wheat can be directly sown into significant volumes of crop residue using the Happy Seeder (HS), and the effect on wheat yields and production costs has been studied. The authors mentioned various private and societal benefits of using zero tillage practices and suggested stronger enforcement of the prohibition on burning residue.	The research shows that using the HS instead of traditionally tilled wheat does not generally increase yield.
2	Stubble burning in Punjab: A review	2019	The article emphasizes environmental and health hazards due to stubble burning in Punjab. It throws light on the current situation of farmers and reasons for why they resort to this method. It also discusses few alternatives and schemes offered by state and central government	It does not discuss how the current situation can be improved
3	Stubble Burning: Side effects and Possible alternatives	2017	It is a descriptive paper in which the author has explained reasons behind stubble burning and its side effects. It also discusses various possible alternatives to reduce stubble burning.	It does not elaborate on the steps to be taken to improve the current situation
4	Tillage and residue management for sustaining rice- wheat cropping system in Indo- Gangetic Plains- A review	2017	In this paper, the author explains how crop residue is managed in Indo- Gangetic plains. Also, how crops are grown using zero tillage method to improve soil quality	The analysis of the experiences of adopters of the zero tillage method are not provided in the paper
5	Stubble burning: either farmers to be punished or technology to be improved	2004	The article mainly focuses on the reasons why farmers have to burn the stubble. The problem arises due to the use of mechanized harvesting which leaves several inches of stubble in the fields.	It does not discuss how the current situation can be improved
6	Socioeconomic and Environmental Implications of Agricultural Residue Burning	2015	This is a descriptive paper where the authors have given a detailed study concerning the results of stubble burning. This paper provides various alternative uses of crop stubble.	The suggestions offered require behavioral changes on the farmer's end with no monetary benefits.
7	Stubble Burning in North-West India and its Impact on Health	2017	By comparing Cereal Crop Residue Production and Burnt in Different North-West Indian States in 2008–2009, it investigates the status of crop residue burning. It also makes recommendations, such as raising farmers' knowledge and utilising stubble in the paper sector and power generation	It suggests that a specific market mechanism should exist that provides farmers with assurances about the acquisition of the residue and deters them from burning stubble, but there is currently no such marketplace operating.
8	Residue burning in rice-wheat cropping system: Causes and implications	2004	It is necessary to enhance harvesting techniques and manage RWS in a sustainable manner since residue burning results in nutrient and resource loss and negatively impacts soil qualities.	This paper does not provide any solution for stubble management without any effect on the environment.

9	The Extent and Management of Crop Stubble	2015	It offers readings on a variety of residue-related subjects, such as chemical composition, pollution brought on by burning residue, the adverse effects of burning on both human and animal health, and numerous techniques for dealing with agricultural stubble.	This report describes the burning of agricultural crop residue in Punjab during the wheat and rice growing seasons. The Indian Remote Sensing Satellite (IRS-P6) Advanced Wide Field Sensor (AWiFS) data obtained between May and October 2005 have been assessed to establish the amount of burnt regions and, subsequently, the greenhouse gas (GHG) emissions from burning crop residue. The results show that as compared to paddy fields, residual emissions from Punjab's wheat harvest are relatively low. In rice-wheat systems, it is claimed that utilising agricultural wastes in the soil as opposed to burning them is far more environmentally friendly and more sustainable.
10	Biomass burning and its effects on health.	2004	The concerns to the public's health associated with burning biomass, whether indoors or outdoors, are brought to the notice of lung experts, public officials, and the general public in this review paper.	This paper covers topic on how biomass combustion affects pollution levels in Europe and the growing scientific evidence of the detrimental health effects of biomass combustion by-products.
11	Agriculture crop residue burning in the Indo-Gangetic Plains - A study using IRS-P6 AWiFS satellite data	2006	The burning of agricultural crop residue in Punjab during the growing seasons of the wheat and rice crops is described in this paper. Data collected between May and October 2005 by the Indian Remote Sensing Satellite (IRS-P6) Advanced Wide Field Sensor (AWiFS) have been evaluated to determine the extent of burnt regions and, consequently, the greenhouse gas (GHG) emissions from burning crop residue. According to the findings, Punjab's wheat crop residual emissions are relatively modest when compared to those from paddy fields. It is implied that using agricultural wastes in the soil rather than burning them is far more environmentally benign and extremely sustainable in rice-wheat systems.	The satellite data was collected every 15 days; it's also likely that the burned rice stubble area was replanted for the following crop and was not selected by the NBR index.
12	Stubble burn area estimation and its impact on ambient air quality of Patiala & Ludhiana district, Punjab, India	2020	Farmers are now burning the stubble due to increased mechanization, such as the use of combine harvesters, and the lack of an economically feasible alternative. This causes abrupt environmental effects due to an increase in ambient air pollution levels.	Based on satellite data that is currently available, the estimated areas have been determined. Some of the photographs weren't processed because of the severe cloud cover. Furthermore, the area of rice stubble burning during that time may have been slightly underestimated due to the matching of the bare land signature with the burned signature.

3. PROPOSED APPLICATION ARCHITECTURE

The application architecture focuses to help you understand how the application actually works.

There are 3 user classes:

- 1) **Farmer (Seller):** The farmer first needs to register and create an account on the application. A farmer can make a post having all the required information about his product. He can also view, delete and edit a post he

posted on the platform. He can view NGOs and Agriculture Institutes' information who can assist the farmer on stubble disposal.

- 2) **Companies (Buyer):** The buyer first needs to register and create an account on the application. The buyer can view all the posts made by the sellers on the platform and contact them via email or mobile number. The posts are segregated on the basis of crops' stubble.
- 3) **Admin:** Admin can add NGOs and dealers in the database. He can also view, delete and edit NGOs and dealers from the database.

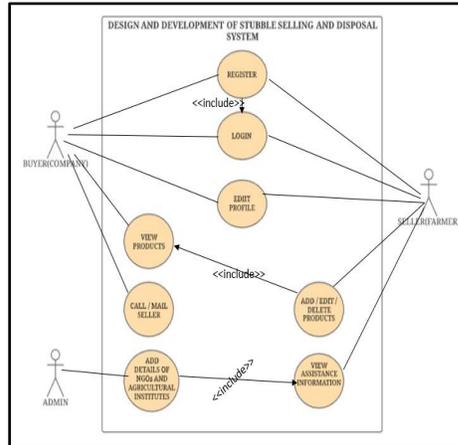


Figure 1 Use Case Diagram

The application functions vary with the user using it.

Farmer (Seller):

- 1) Registration and Authorization: The farmer will enter his name, email, mobile number, location and set a password. He must be able to login securely to his account with the mobile number and set password.
- 2) Edit Profile information: The farmer can change his personal information like name, email, mobile number, location
- 3) Post a product: The farmer can add a product by choosing the stubble type, specifying quantity and price of the stubble.
- 4) Edit a post: A post can be edited by changing the quantity or price of the stubble.
- 5) Delete a post: The farmer should be able to delete a post.
- 6) View posted products: All the posts made by the farmer should be seen on the home page.
- 7) View NGOs and Agriculture Institutes' information: The contact information of assistance providers like mobile number, location, email should be visible to farmers.
- 8) View information of dealers selling or renting machines for stubble disposal: The contact information of dealers like mobile number, location should be visible to farmers.

Buyer:

- 1) Registration and Authorization: The buyer will enter his name, email, mobile number and set a password. He must be able to login securely to his account with the mobile number and set password.
- 2) Edit Profile information: The buyer can change his personal information like email and mobile number
- 3) View products posted by sellers: All the products posted on the platform must be visible to the buyer.
- 4) Filter products on the basis of stubble type

Admin:

- 1) Add contact information of NGOs and Agriculture institutes on the platform: The admin should be able to add the name, mobile number, email and location of the assistance providers.

- 2) Add contact information of dealers of stubble cutting machinery on the platform: The admin should be able to add the name, mobile number and location of the dealers.

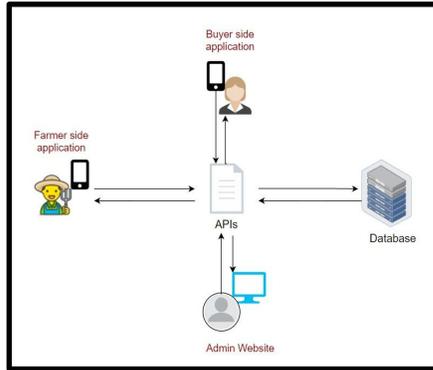


Figure 2 Application Architecture

4. RESULTS AND DISCUSSION

Seller side:



Figure 3 Splash Screen

A splash screen, also known as a launch screen, is the first screen with the logo application name Avshesh.

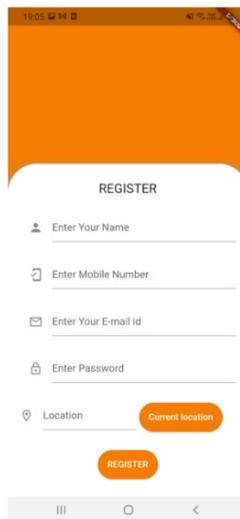


Figure 4 Register Page

This is the registration page where the farmer will enter his name, email, mobile number, location and set a password. This page consists of various validations for each field.

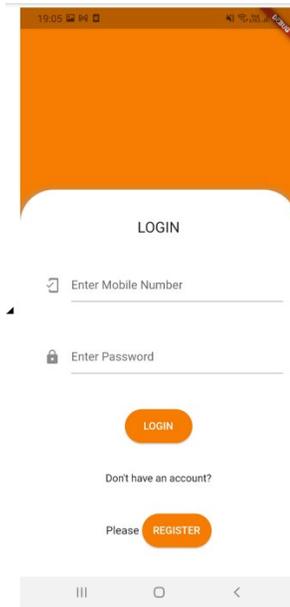


Figure 5 Login Page

This is the login page where the farmer will be able to login securely to his account with the correct mobile number and set password.



Figure 6 Profile Page

This is the Profile page of the application where the farmer can see all the details provided by him during registration. Farmer can also change the display picture and other details.

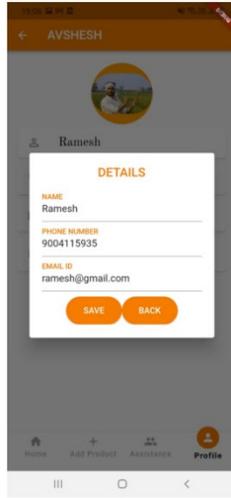


Figure 7 Edit Details Page

This is the Edit Profile Page where the farmer can change his personal information like name, email and mobile number.

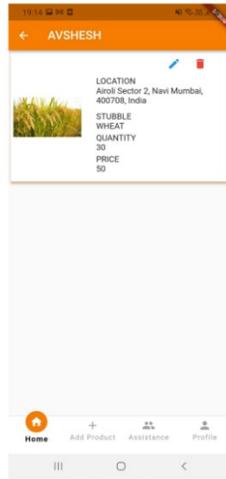


Figure 8 Home Page

This is the Home page where farmers can view all the products added by them. They can also edit and delete the posts.

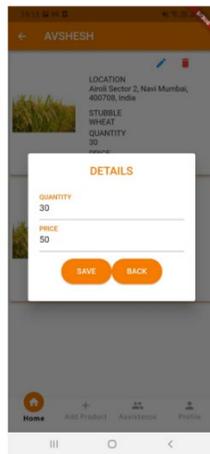


Figure 9 Edit Post Page

This is the Edit Post page where farmers can edit the quantity and price of the product.

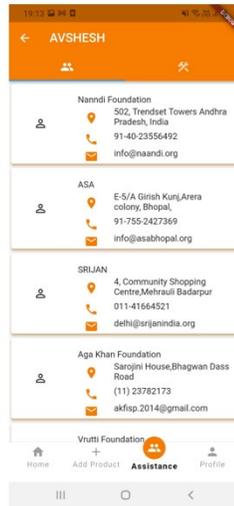


Figure 10 Assistance Page-NGO Tab

This is the NGO tab of the Assistance page where the farmers can view all the details of the listed NGOs and the Agricultural Institutes.



Figure 11 Assistance Page-Dealer Tab-1

This is the Dealer tab of the Assistance page where the farmers can view all the details of the listed dealers for the machinery they require.



Figure 12 Assistance Page-Dealer Tab-z

This is the Dealer tab of the Assistance page where the farmers can view all the details of the listed dealers for the machinery they require.

Buyer side:

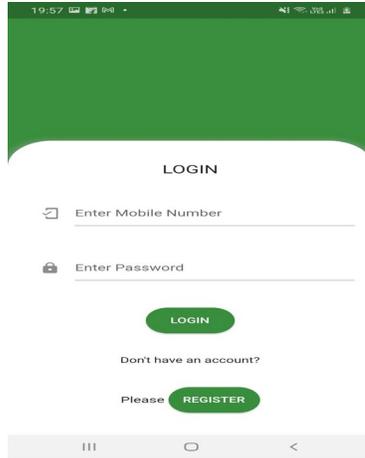


Figure 13 Login screen

This is the login page where companies will be able to login securely to his account with the correct mobile number and set password.

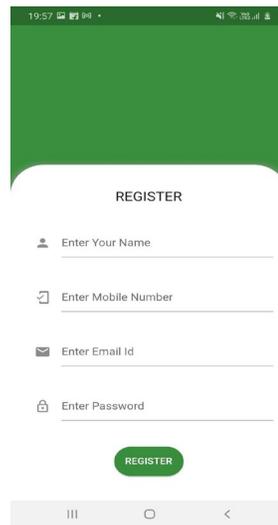


Figure 14 Register Screen

This is the registration page where the farmer will enter his name, email, mobile number, location and set a password. This page consists of various validations for each field.

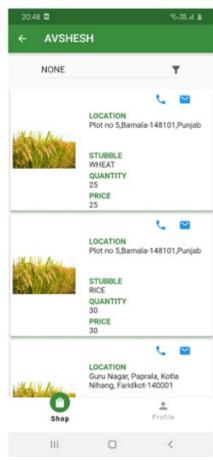


Figure 15 Home Screen

This is the Home page where companies can view all the posts posted by the farmers They can also use the contact information for contacting the farmers.

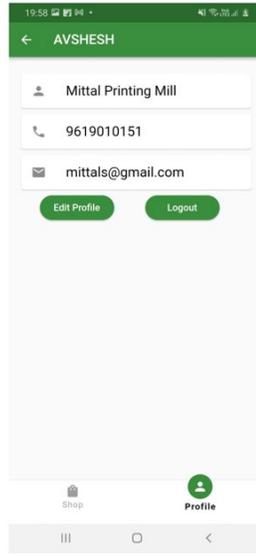


Figure 16 Profile Screen

This is the Profile page of the application where the company can see all the details provided by him during registration. Farmers can also change the display picture and other details.

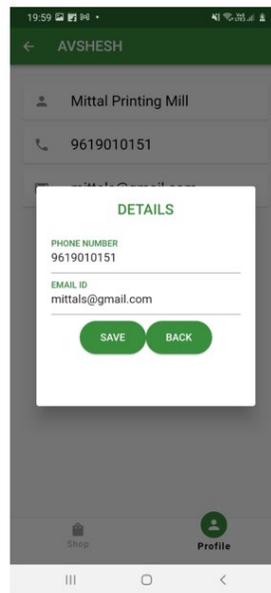


Figure 17 Edit Profile Screen

This is the Edit Profile page where companies can edit information like phone number, email id.

5. CONCLUSION

Pollution levels rise as farmers burn post-harvest residues to clear fields from summer crops and make way for sowing wheat. The projected nutrient losses from burning paddy straw are 3.85 million tonnes of organic carbon, 59,000 tonnes of nitrogen, 20,000 tonnes of phosphorus and 34,000 tonnes of potassium in the soil. The soil's nitrogen budget is also negatively impacted by this. The proposed application caters to all the problems and can reduce stubble burning

to a large extent. Using this application, farmers can easily sell their stubble to the companies who can make use of these stubbles as a raw material to make useful products. And if the stubble is not sold farmers will be provided with assistance where they will be connected to various NGOs and Agricultural Institutes which can assist the farmers in getting rid of the stubble. Farmers are also provided with a contact list of dealers which supply machinery that is used for clearing stubble. This project is a one stop solution for controlling stubble burning and to scale down air pollution eventually resulting in better soil and air quality

6. FUTURE SCOPE

More features can be added such as payment options where companies can easily pay the farmers for the stubble. Since there are farmers who are not so familiar with mobile application and English language, we can provide them the application in 3 different languages i.e. Hindi, Punjabi, English. In future we can make this website viable for more states since now only Punjab and Haryana can make use of it.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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