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# Design and Implementation of an Android Application for Betterment of Farmers

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***Abstract:*** ***After the contentious reforms framed by the government for farmers, their lives have been exacerbated. They are not able to get an equitable price for the production because of middlemen and their burgeoning commission. Apart from that, because of the lack of knowledge amongst the farmers about certain things like mercurial weather conditions in the monsoon, contamination of crops because of certain deleterious pesticides, queries regarding soil fertility etc. they have been suffering through huge losses financially as well as their productions are getting wasted. An idea is presented here which can help farmers get better prices for their produced goods excluding the middlemen and their hefty commissions. Also, legit advice from an expert can help farmers a lot to increase the production as well as financial losses can be prevented. In the proposed idea, an android mobile application developed in Android Studio, an official integrated development tool or environment for Google's Android operating system with farmer-friendly UI designed in Adobe XD is implemented in JAVA and firebase cloud firestore is used in the backend to get interminable services.***

***Keywords: Android Studio, Firebase Cloud Firestore, Android Development, Adobe XD, JAVA, Software Engineering***

## I. INTRODUCTION

The introduction of mobiles and applications in the various fields ushered in a revolution in the last decade. The initial usage was in the advertising, marketing and various service sectors. Later it expanded into various sectors like healthcare and insurance leaving no industry and organization untouched. The exponential pace of application development encouraged the research community to understand all vertices in a niche. But if we look into the agriculture sector, it's quite lagging behind compared to other burgeoning sectors. More than half of Indians work on farms, but farming accounts for barely a sixth of the country's GDP. Declining productivity and lack of modernization have long hobbled progress. Plot sizes are shrinking, as are incomes from farming. Prices can be wildly fickle and middlemen form cartels and gobble up much of the profit. For a long, farmers have sold their crops in 7,000-odd government-regulated wholesale markets or "mandis" across the country. They are run by committees made up of farmers, often large landowners, and traders or "commission agents"who act as middlemen for brokering sales, organizing storage and transport, and even financing deals. The concept of this paper is aimed at developing a mobile application for farmers which would help them get an apt price for the productions. Also, help them with the ideas from experts, plan for better productivity and get their qualms resolved..

## II. EXISTING APPROACH

Currently, India's agricultural markets are regulated by the states under the Agricultural Produce Marketing Committee (APMC) Act. Under the APMC Act, the states can establish agricultural markets, popularly known as mandis. The sale of agricultural commodities can occur only in the mandis through auction. The sales process in mandis is regulated through commission agents (CAs) who mediate between the farmers and traders. The reasons are exploitation by CAs, lower price realization, lack of transparency in the trading process, collusion among traders, price cartelization, delay in payments and low quality of mandi infrastructure. The delay in payments to the farmers ranges from three to fifty days. Instant payment is made only after deducting the interest on loans obtained by farmers from CAs. The payment delay forces the farmers to depend on borrowing from CAs, local money lenders and savings for their daily expenses.

## III.PROPOSED SYSTEM

To achieve the said aim, the application has three major users, a farmer, a vendor and an expert. A system that provides an interface to sell their produced goods by connecting to the vendors all over the country. A farmer-friendly mobile application is developed. Farmers will add the name, type, produced quantity, price per kilogram/quintal/tones, shelf-life of the product, also add the description of the product which includes any necessary information that the vendor needs to know before buying such as health of crop, disease (if any), they also need to add images of produced crops/fruits/vegetables etc.

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These details of the product will go into the firebase cloud firestore. All these product details will be fetched from the database and displayed on the vendor side. Also, contact details of the farmer will be provided so that the vendor can contact him if he has any queries regarding the product. After that, the vendor can buy the product and make the payment using debit/credit card, UPI or any other online platform. Farmers can get a better price for their products, no additional cost spent in marketing and delivery of goods. However, they can choose to charge more by delivering the items themselves. Better rates for vegetables make the farmers live with pride and make additional income. Overall profitability in the deal for the buyer to purchase directly from the farm, excluding the middle-man. To register as an Expert, a proof would be required, which would be verified by the admin, and then they would be allowed to resolve the queries of farmers, help them in terms of crop suggestion, precautions based on the meteorological department forecast of rainfall/weather, potential pest attacks, weather warnings etc. Also, steps for producing high yield that are specific for a farmer based on the local, regional terrain, weather scenario, rather than generic guidance will be given.

## IV. CLASS DIAGRAM

Static models of a system describe the structural relationships that hold between the pieces of data manipulated by the system. They describe how data is parcelled out into Objects, how those objects are categorized, and what relationships can hold between them. They do not describe the behavior of the system, nor how the data in a system evolves over time. These aspects are described by various types of dynamic models. The most important kinds of static models are object diagrams and class diagrams. An object diagram provides a 'snapshot' of a system, showing the objects that actually exist at a given moment and the links between them. Many different object diagrams can be drawn for a system, each representing the state of the system at a given instant. An object diagram shows the data that is held by a system at a given moment. This data may be represented as individual objects, as attribute values stored inside these objects or as links between objects.

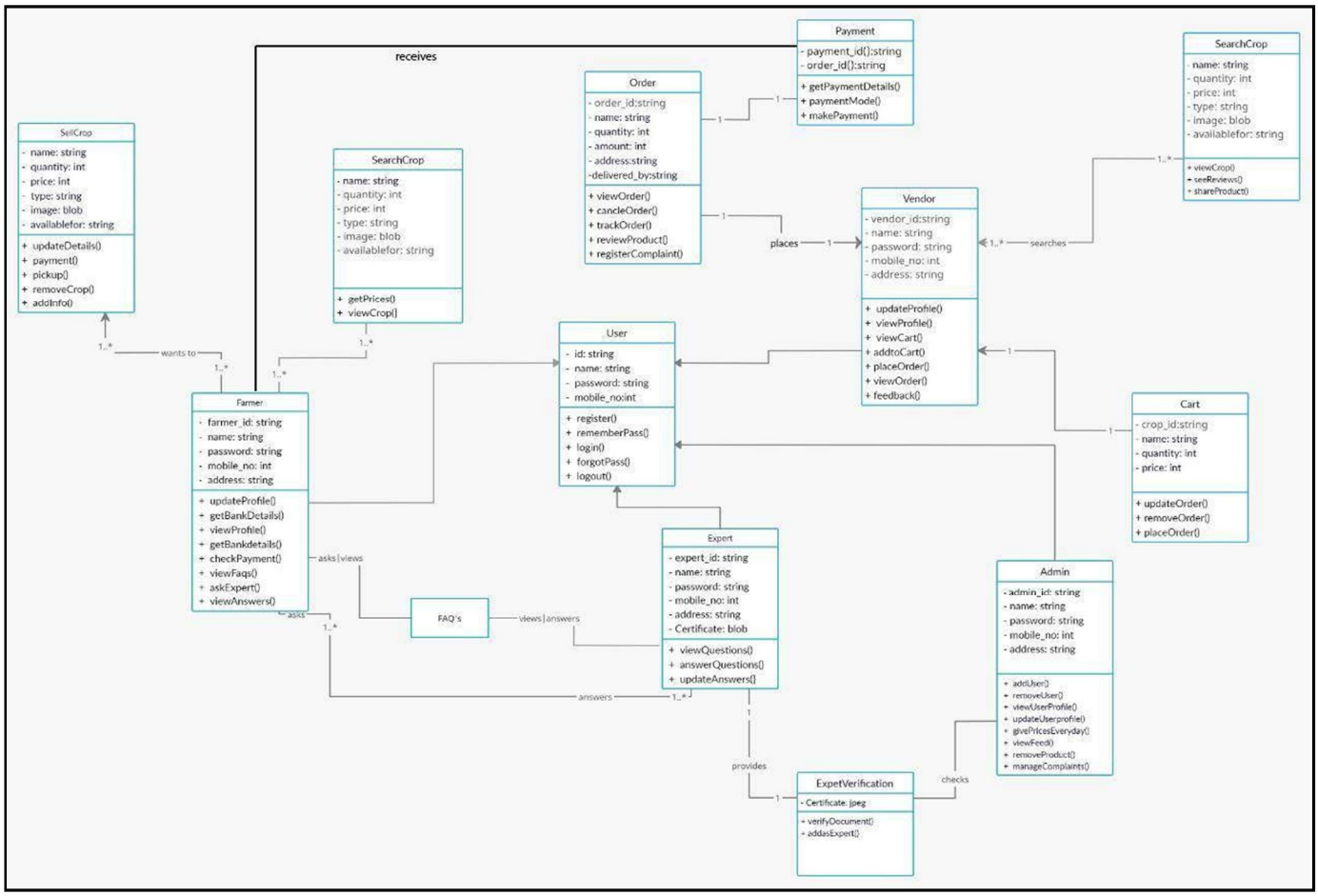



Fig 1. Class diagram

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## V. SEQUENCE DIAGRAM

A sequence diagram focuses on time sequencing or time ordering of messages or the order in which messages are sent. The emphasis in these diagrams is what happens first, second, and so on. They represent the passage of time graphically. Since a sequence diagram may be developed for each primary use case, including use case and extended use case, there will be a number of sequence diagrams developed. Following are a few of the major functionalities of application and their sequence diagram:

### *A. Update Profile*

After logging in, if any of the users wants to edit their information like naming, city/village or add an email, then he/she can do that and new information will be updated in the database and the user will be given confirmation regarding that.

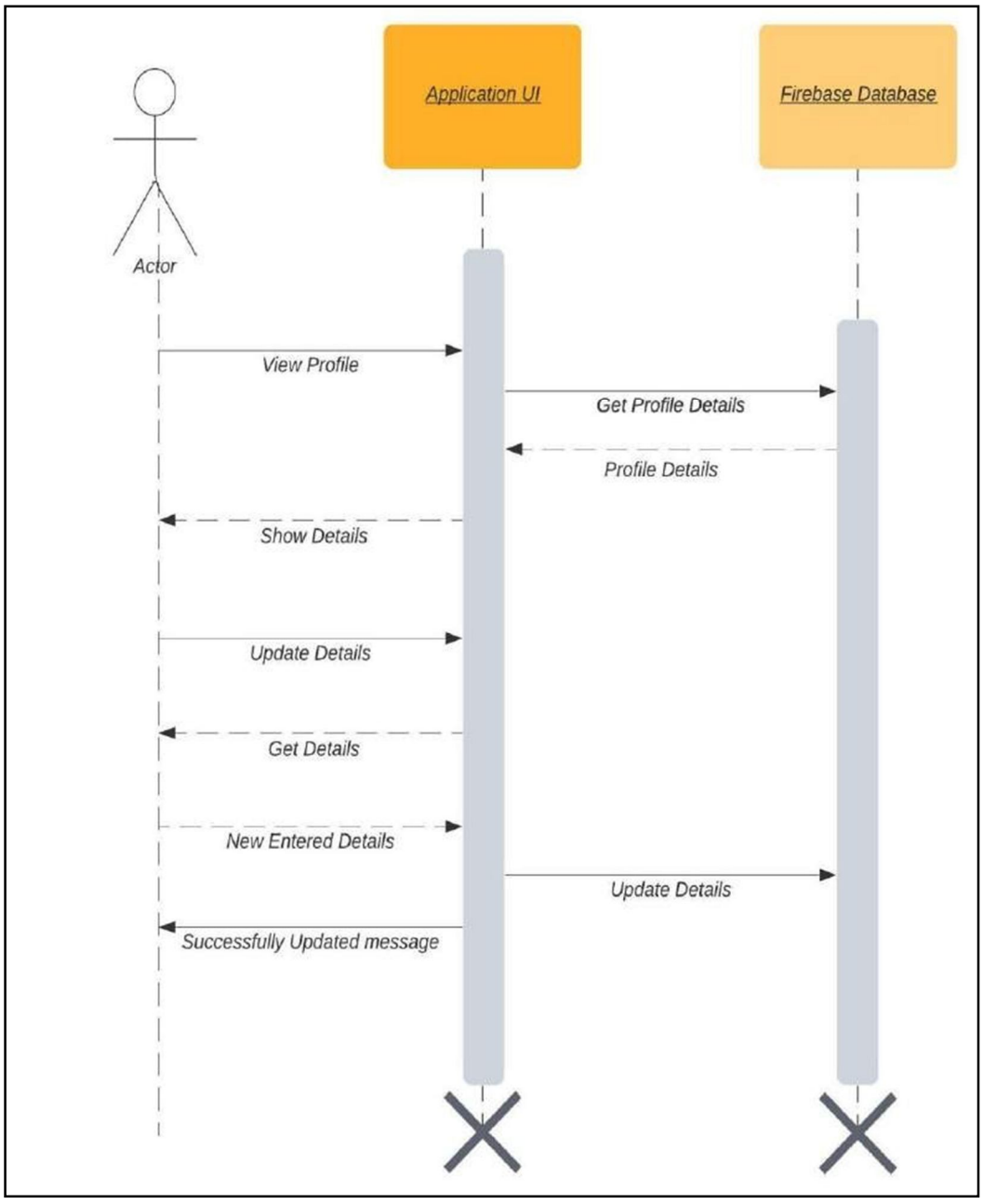



Fig 2. Sequence Diagram of Update Profile

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*B. Sell Products*

If a farmer wants to sell products, he/she can do that by entering apt information about the product, adding its images, description as well. All the information of each product will be stored in the database and retrieved on the vendor side of the application. After the product is successfully added to the database, the farmer is given confirmation about the same.

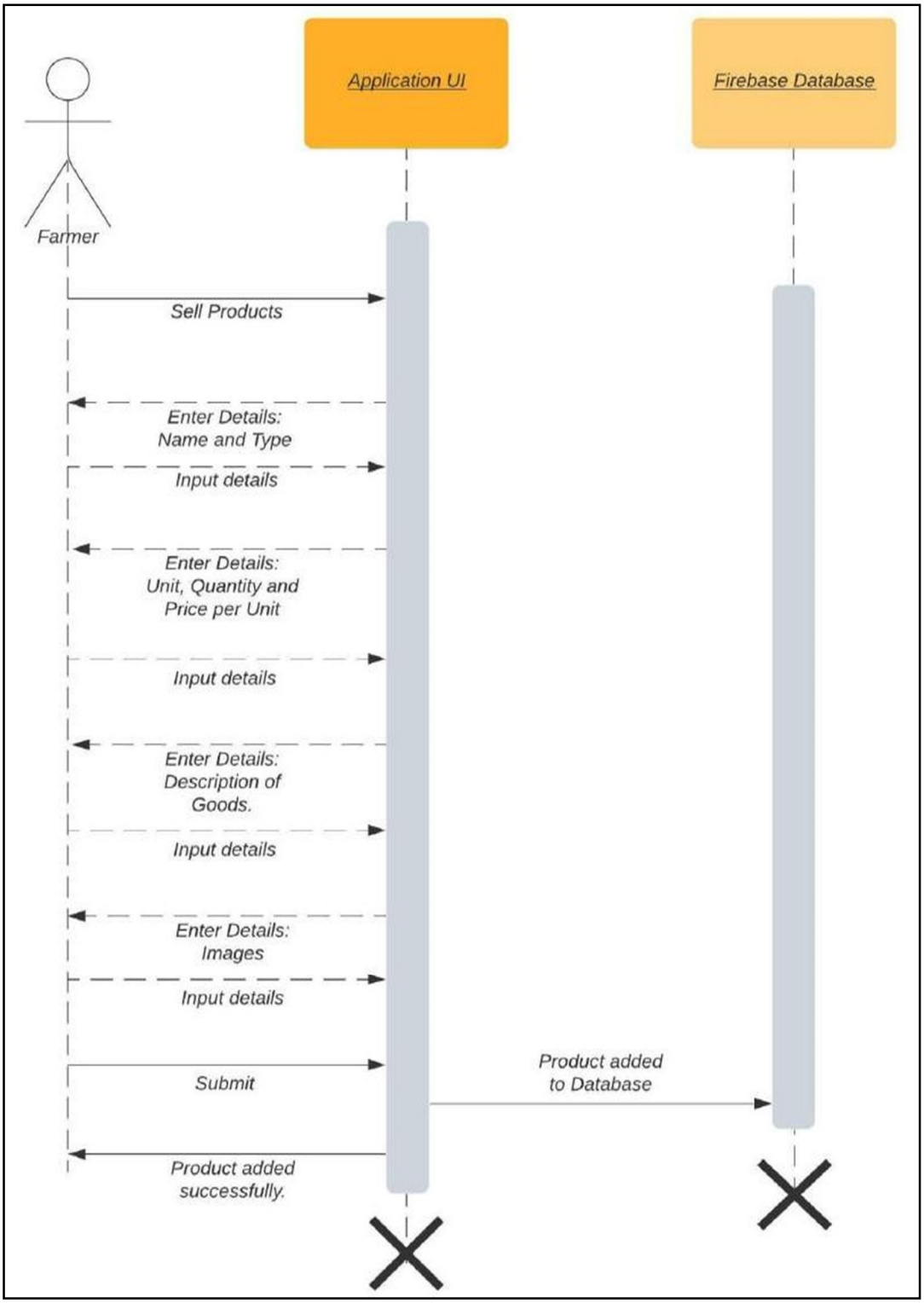



Fig 3. Sequence diagram of Selling Products

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*C. Search and Buy Products*

Now if a vendor wants to search for a particular product, then, he/she can add filters such as type of the product or region in which he/she wants to search as well as range of price he/she can afford. After exploring the product, when he/she wants to purchase that product, then he/she can add it to the cart and proceed further by adding the delivery address and selecting the payment method. On successful placing of the order, he/she will receive a notification and the selected product will be added to the database under his/her primary key.

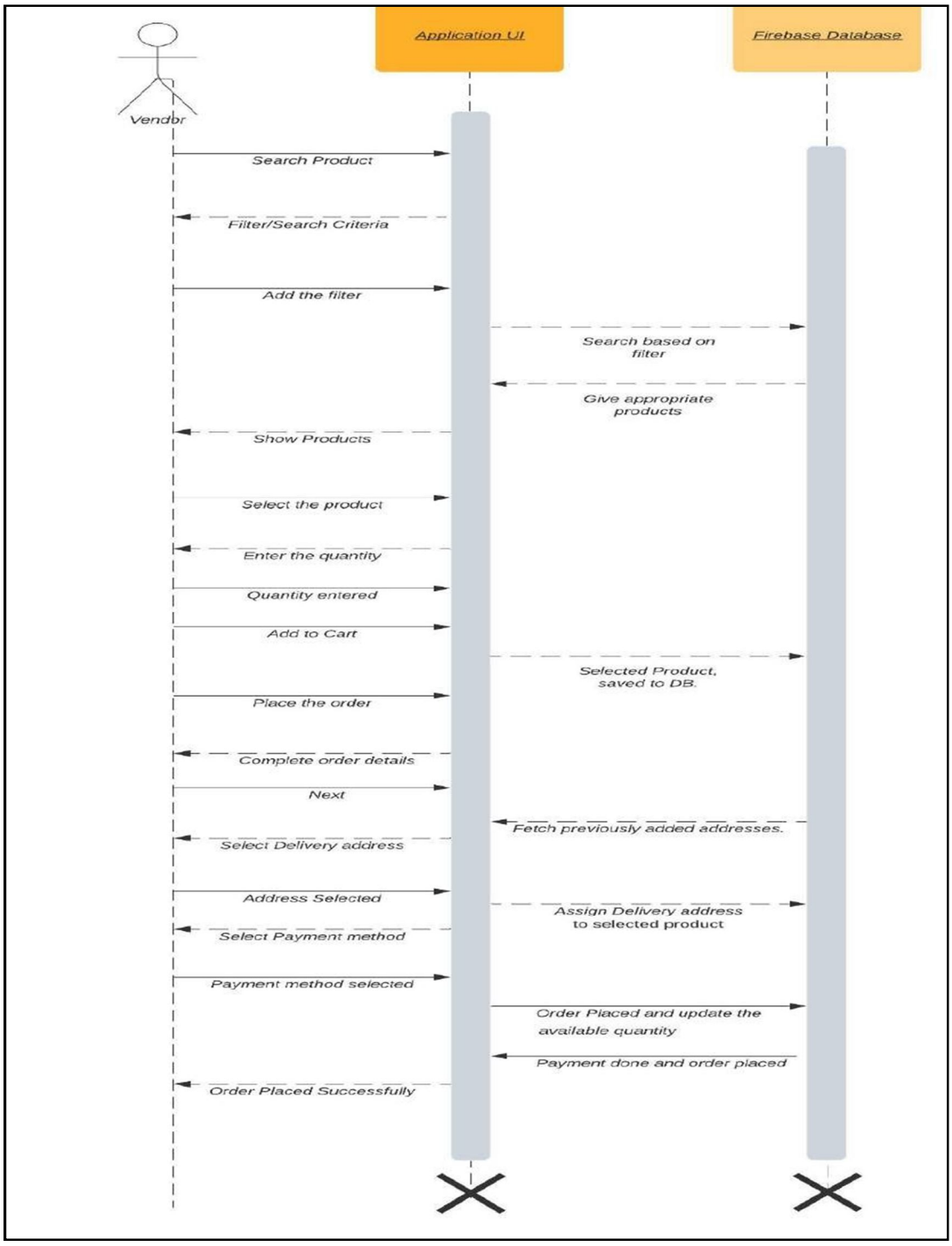



Fig 4. Sequence diagram of searching and buying products

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*D. Search FAQs and Ask Experts*

When a farmer has some query related to weather, crops, disease etc. He/she can search in the FAQ section, if an answer is found, then great. Otherwise, he/she can elaborate his/her question, add a few images and ask the expert. The question asked will be saved in the database under his/her primary key, and the answer will be displayed when an expert answers the question.

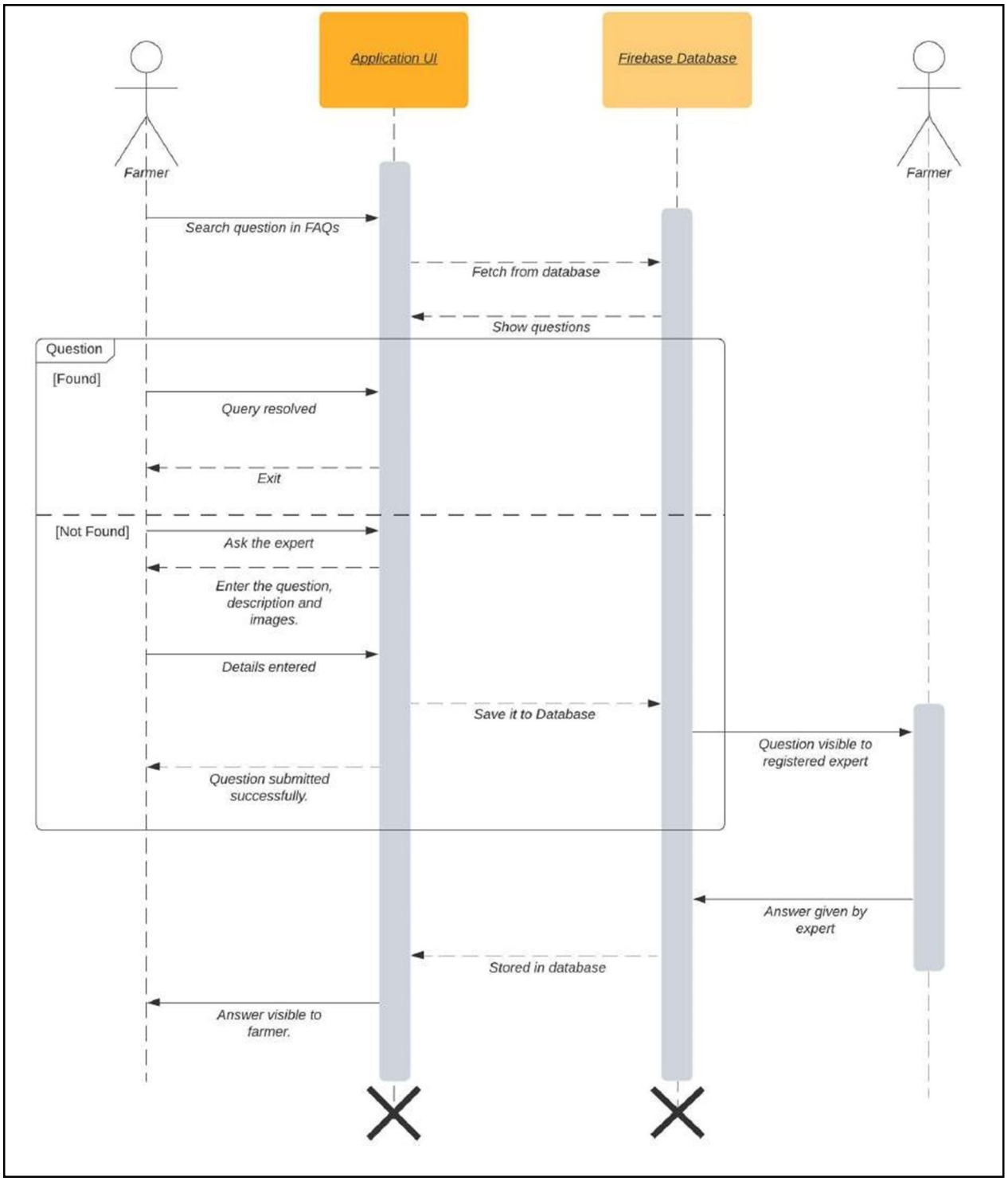



Fig 5. Sequence diagram of searching FAQs and asking expert.

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*E. Expert Answer the Question*

Questions asked by farmers will be visible to an expert in a list. Experts can select any particular question and answer that, add images to explain it properly and submit it. Answers will be stored in a database and visible on the farmer's side.

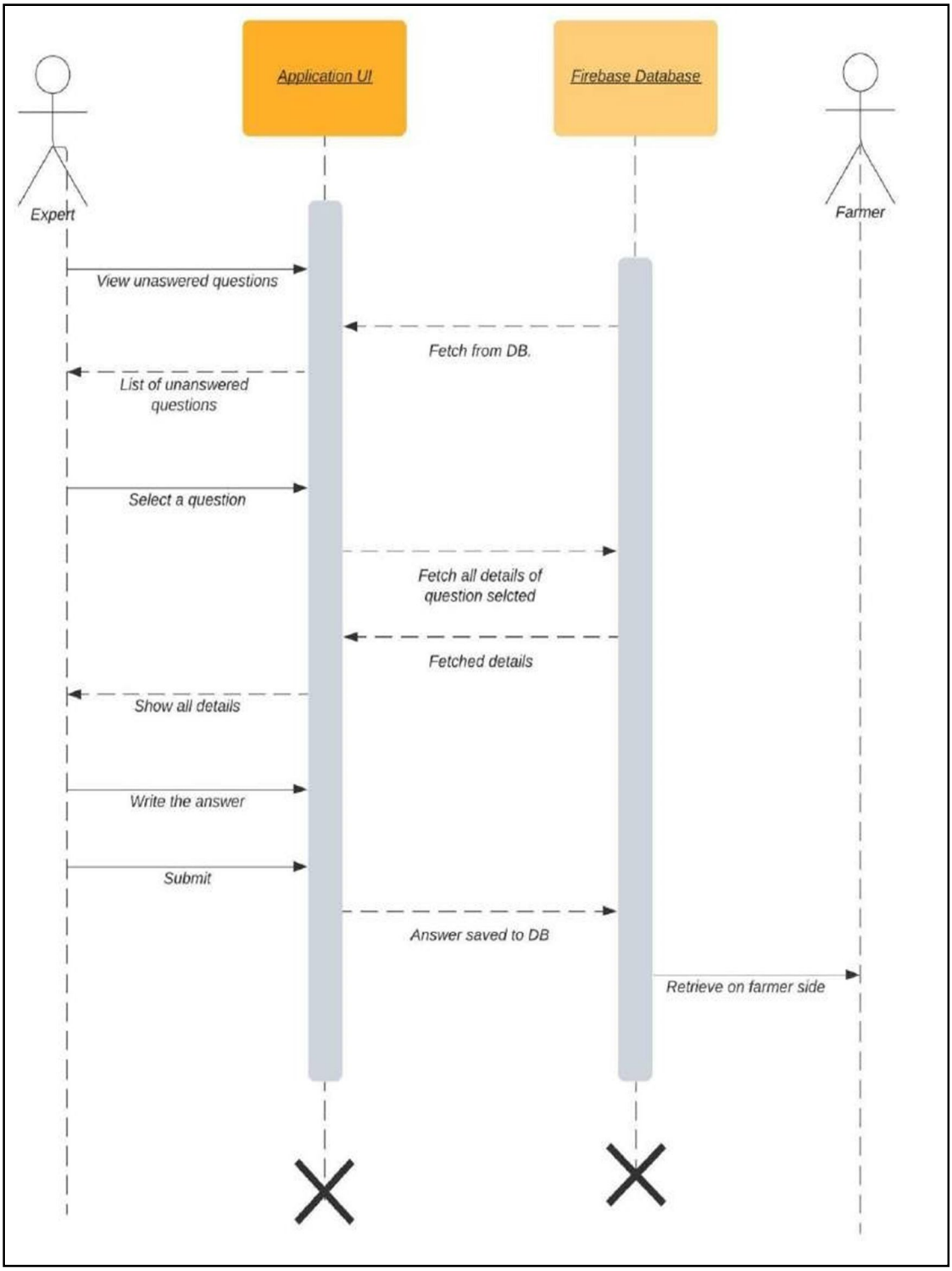



Fig 6. Sequence diagram of expert answering the question

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## VI. SYSTEM OVERVIEW

### *A. Common Screens*

A few of the things are common to all the three users: farmer, vendor and expert, that is, the splash screen, log in, register, Forgot Password and entering OTP while registering. Below are those things:

1) *Splash Screen*: Initially, when the android application is started, first of all a splash screen will be opened, which will be static for 5 seconds. The splash screen includes the application name with its logo as shown in Figure 1.
2) *Login Screen*: The system will be redirected to the Login Screen after splash time is over. If a user is already registered, he/she can directly log in to the system with the help of the registered mobile number and password. If they want the system to remember the password for further use, they can select the checkbox of "Remember Me". If they have forgotten the password, then they can select "Forgot Password" which will instruct them further.




Figure 7. Splash Screen and Login Screen

3) *Registration Screen:* After the splash time is over, if the user is new to the application, then he/she has to register himself/herself. So, by selecting "Don't have an account? Create one." they'll be redirected to the screen where they have to select who they are, a farmer, a vendor or an expert. After that, they'll be redirected to the registration screen. While registering Expert has to add a legit certificate which will be verified by Admin after that only he/she will be able to resolve queries of farmers. On clicking on "Continue", entered details will be stored in the database. Fragments are used to implement the Login Screen and Registration Screen activities instead of normal intent




Figure 8. Choice and Registration

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4) *Forgot Password:* If the user selects "Forgot password" then he/she will be redirected to this screen. Over here they'll be asked to enter the registered mobile number as shown in Figure 3. They'll receive a link to reset the password.
5) *Entering OTP:* When a new user has filled in all the required details on the Registration Screen, he/she will be redirected to the Entering OTP screen. They will receive an OTP by text message which they have to enter over here as shown in Figure 3.

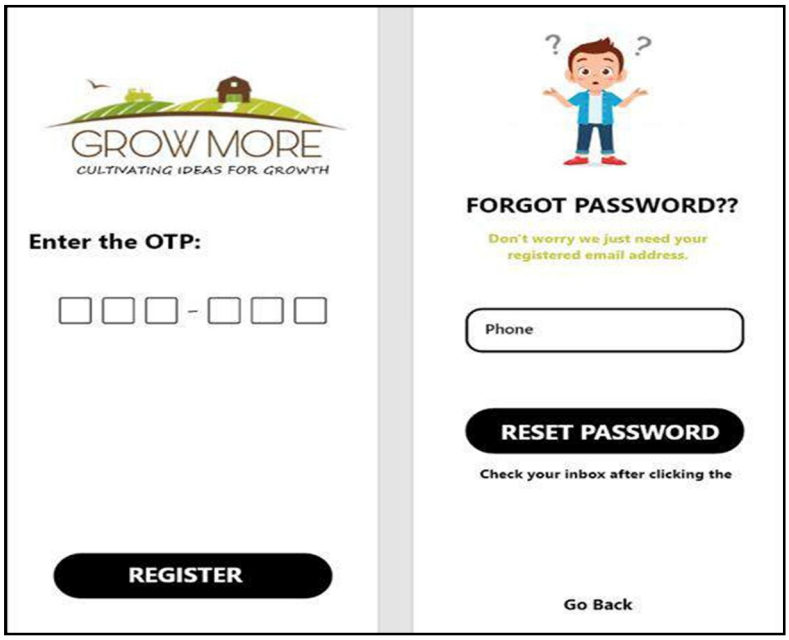



Figure 9. Entering OTP and Forgot Password

*B. Farmers*

The major activities on the farmer side are to add the product details which they want to sell, add bank account details to receive payment, update the profile, get the list of orders received, ask queries to experts, search in FAQs.

1) *Home Screen*: The home screen of farmers has a banner slider, which will display the latest news related to agriculture, government decisions, government acts and "yojanas" for farmers etc. From the right side of the title bar, they can change the language of the system or log out of the account. Apart from that, whichever action they want to perform, they can select and it will be redirected further.

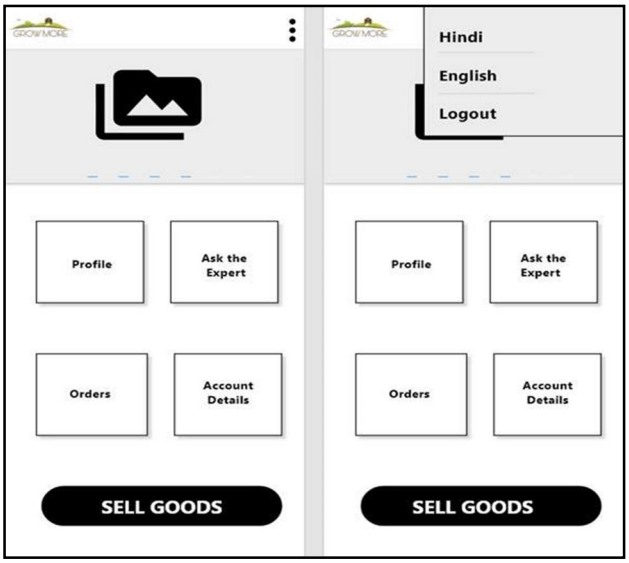



Figure 10. Home Screen (Farmers)

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2) *Sell Goods:* When a farmer selects "SELL GOODS" from the home screen, he/she will be redirected to this. Over here, the product name and type are to be entered. Then the unit of quantity like quintal/kilograms/tones. Also, the quantity of the product available with them and the price of that per kilogram/quintal/tone. After that they have to add the shelf life of the product and description like if the crop had some disease or any other thing that they think that the vendor needs to know before buying the product. And at the end, they have to add the images of the product. After that, the product will be added to the database.

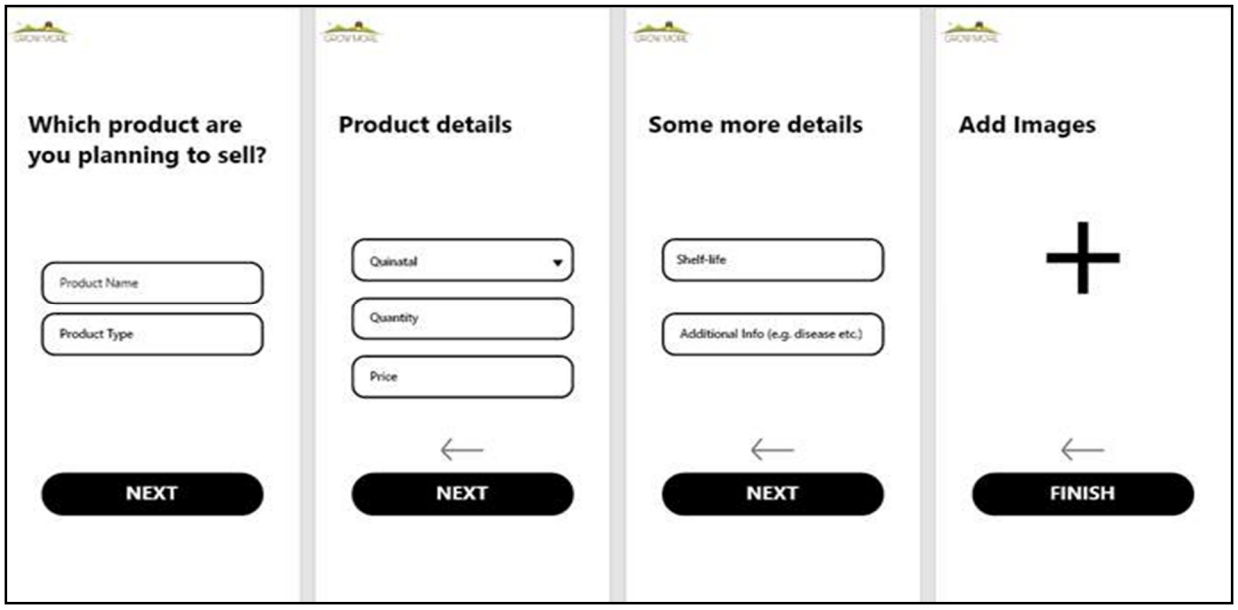



Figure 11. Sell Goods.

3) *Profile and account info:* Over here, when a farmer selects Profile, then he/she will be redirected to this where they can update their name, city/village or add an email. Farmers cannot change their phone number as shown in Figure 6. When they select "Account Details", they will be redirected to the screen where they can see all their added accounts. If they want to add a new one, then they can fill in the details that are asked for and submit it as shown in Figure 6.

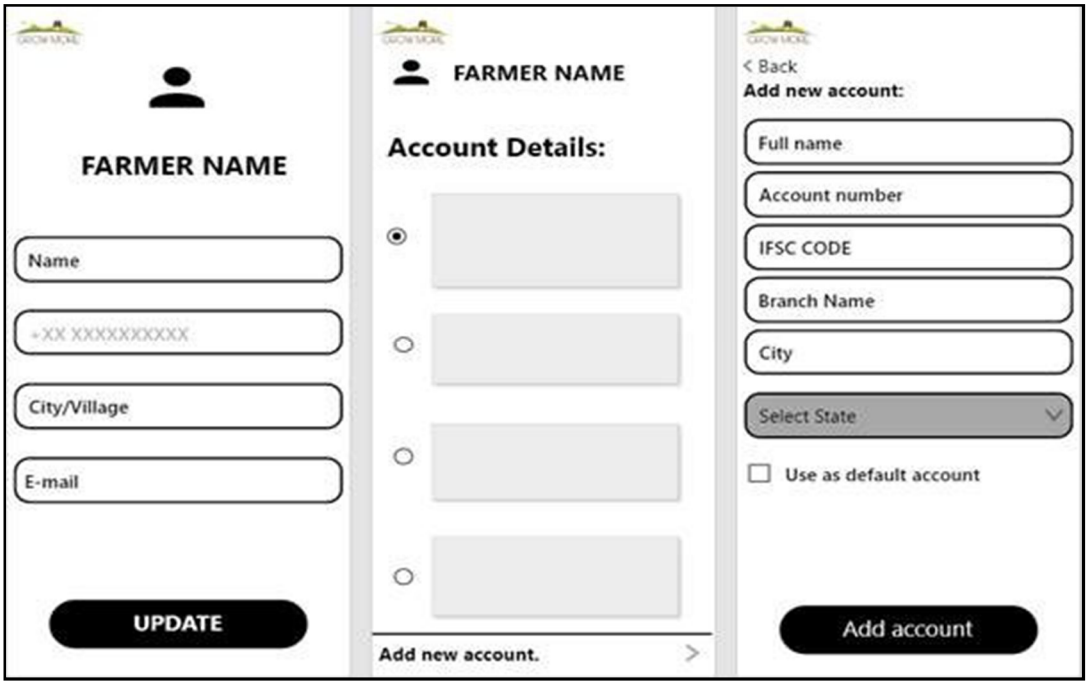



Figure 12. Profile and Account Details

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4) *Order Received:* When a farmer selects "Orders" from the home screen, he/she will be redirected to a list of the orders that he/she has received, which includes all the information like product name, type, quantity, total price. After only when they select "Accept the order" as shown in Figure 7, the vendor will get the notification for the same.

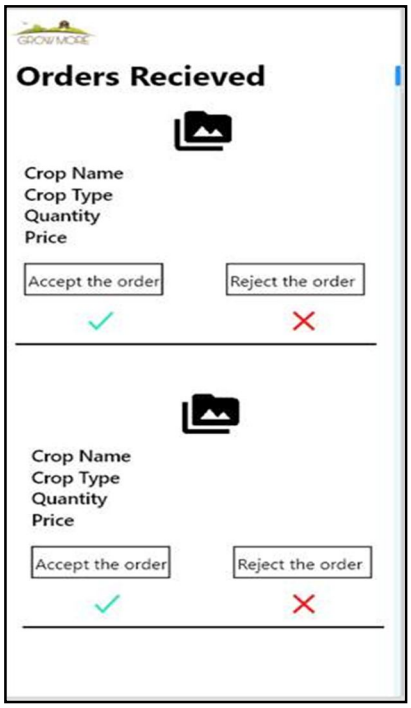



Figure 13. Orders Received

5) *FAQs and Ask the Expert:* Farmers can search for their query in the FAQ section, filter using tags too. If they don't find their question, then they can ask an expert by elaborating their query, and can also add an image to help the expert better understand their question.

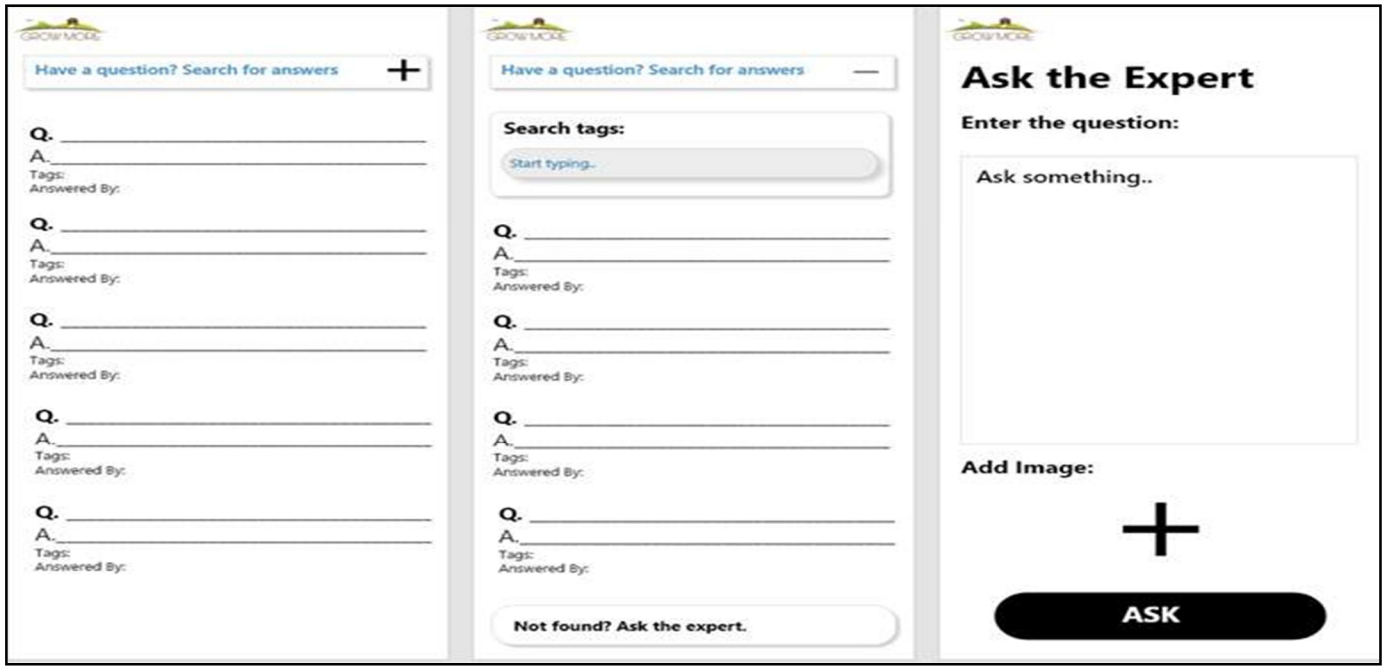



Figure 14. FAQs and Ask the Expert

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*C. Vendors*

On the vendor side of the application, major functionalities are filtering the product as per requirements, all the details for the product that are customer review, star rating, available quantity, farmer details, product description etc. Other than that, at the time of checkout, the vendor can select/add the address for delivery, select the payment method. Vendors can also view previous orders as well as track the current one. Once a product is received, they can write a terse review about the product and also give star ratings which will help other vendors for their purchase.

1) *Home Screen, Navigation Drawer and Filter*: So, when the vendor logs in, he/she is redirected to the Home Screen. On the Home Screen there is a hamburger icon on the top left corner of the screen. There they have options of Home, their previous orders, profile details and logout functionality. On the top right corner there is a cart icon which will redirect them to the cart. Below that there is a search bar which on clicking will display a filter option of variety, state and price as shown in figure 9. Below that there is a categorical list of items that are crops, fruits, vegetables etc. After that, there is a banner slider which will show some of the newly added products. Below that there is a grid layout which will also show some of the products. By clicking on "View All", they will be able to see a grid layout of all products.

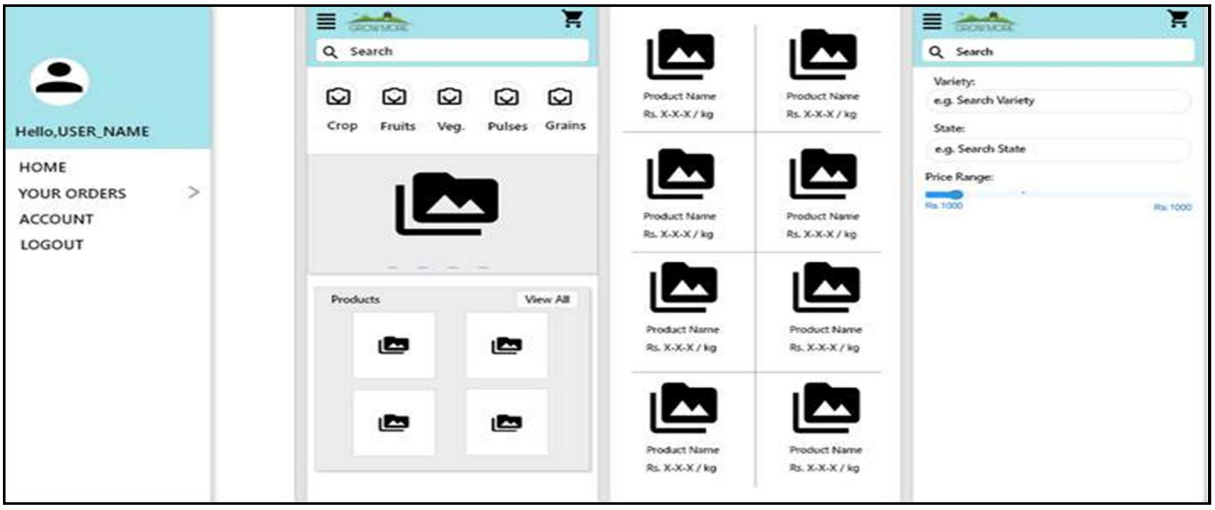



Figure 15. Navigation Drawer, Home Screen (Vendors) and Filter

2) *Product*: When the vendor selects any of the products, the entire detailed screen will be seen. It includes the farmer's name, city, state, images of the product that the farmer has uploaded, its name, type, price, and total available quantity. From that, the vendor can select the quantity that they want. They can also look at the additional details of the product that the farmer has added. They can also look at the reviews given by other vendors and the average stars rating given to the product. If the vendor still has some qualms regarding the crop, he/she can contact the farmer. If a vendor wants to share this product with his/her fellow vendors, he/she can select the share icon and select the medium where he/she wants to share it.

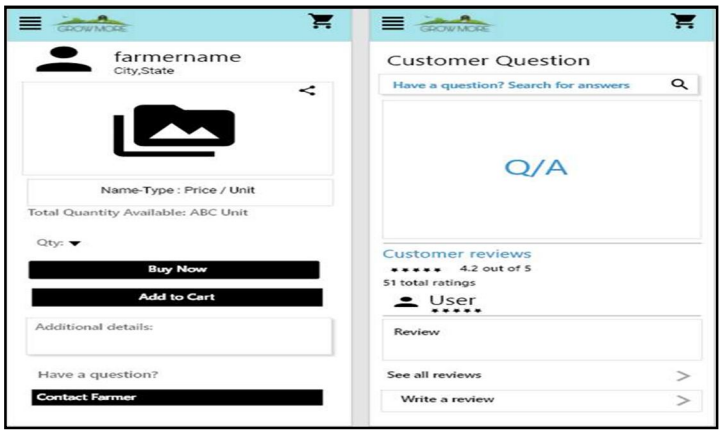



Figure 16. Product Details and Customer Feedback

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3) *Checkout and Delivery Address*: Once a vendor has made his/her decision to buy a particular product, he/she can add the product to the cart by clicking on "Add to Cart" which will pop up a dialog box with a subtotal of the product mentioned. They can also directly buy by clicking "Buy now" which will redirect them to the cart. After that, they will be required to select the delivery address if already added or add a new one if it is the first time

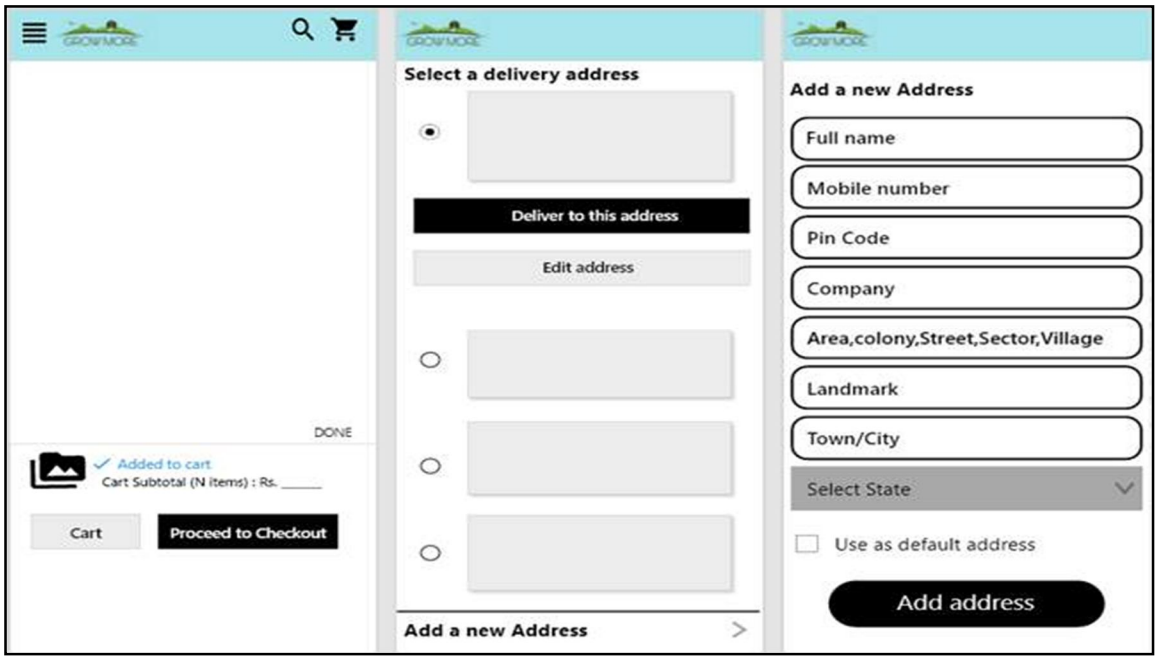



Figure 17. Checkout, Delivery Address and Adding new Address.

4) *Payment methods*: After selecting the delivery address, the final step is payment. For that, the vendor can pay online using Credit Card/ Debit Card. If he/she has done any payments earlier, then card details will already be present, else he/she can add one. APIs of Razor Pay, Paytm and PayUMoney are also added, the vendor can select anyone and proceed further. Once the payment is successful, they'll receive a text message from GrowMore with an Order ID as shown in figure 12.

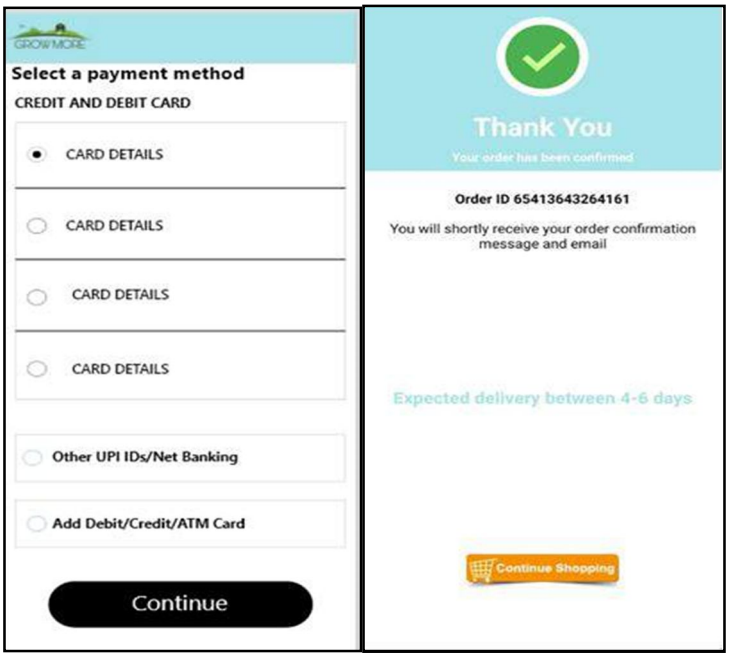



Figure 18. Payment options and Thank You screen

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5) *Previous Orders and Order Details*: Vendors can select "Your Orders" from the navigation drawer and see the entire list of their previous orders. By selecting any of the orders, they can see all the details of that order including order id, date, total amount, delivery date (if delivered), track the shipment, payment method, billing address, delivery address and even download the invoice. They can also write the review, which will redirect them to that screen.

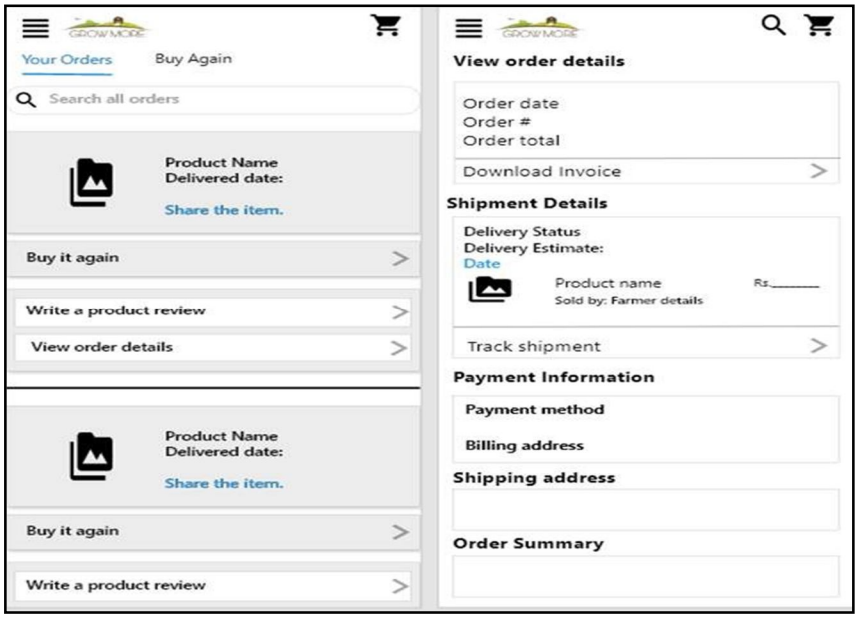



Figure 19. Previous Order list and Order Details

6) *Write a Review*: Vendors can give a star rating to any product, they can also give a brief review about the product, add images and submit it.

*D. Experts*

On the expert side of the application, major functionalities are to view all unanswered questions, view questions and answer them. They can also see their previously answered questions.

1) *Home Screen and Profile*: The home screen of Experts has an update profile, view all the unanswered questions, view all the questions that he/she has answered and logout functionality. Similar to farmers, experts can update their name, city/village, add an email but can't change their phone number.

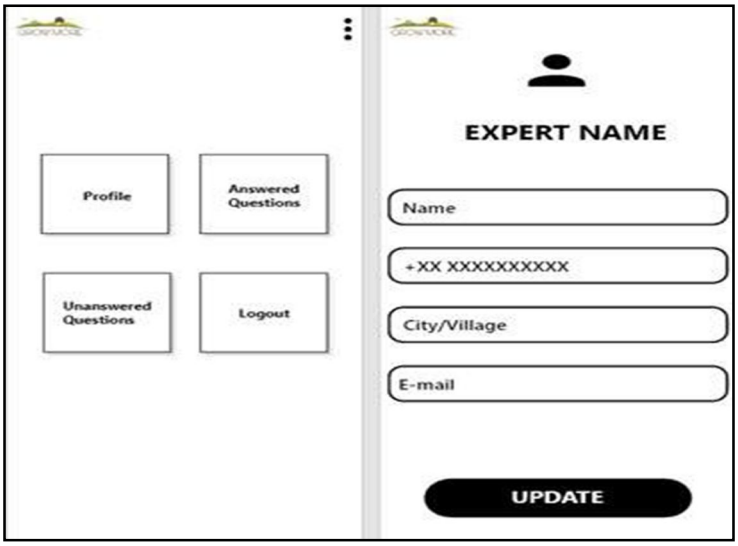



Figure 20. Home Screen (Expert) and Profile

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2) *Unanswered questions*: Then they select “Unanswered questions", they can view all the questions asked by different farmers. Whichever question they want to answer, they can select and it will be redirected to that.




Figure 21. List of Unanswered questions

3) *Question- Answer*: When an expert selects a question from the list, detailed questions posted by farmers with images will be displayed. Experts can answer the question and add the images for better understanding if needed.

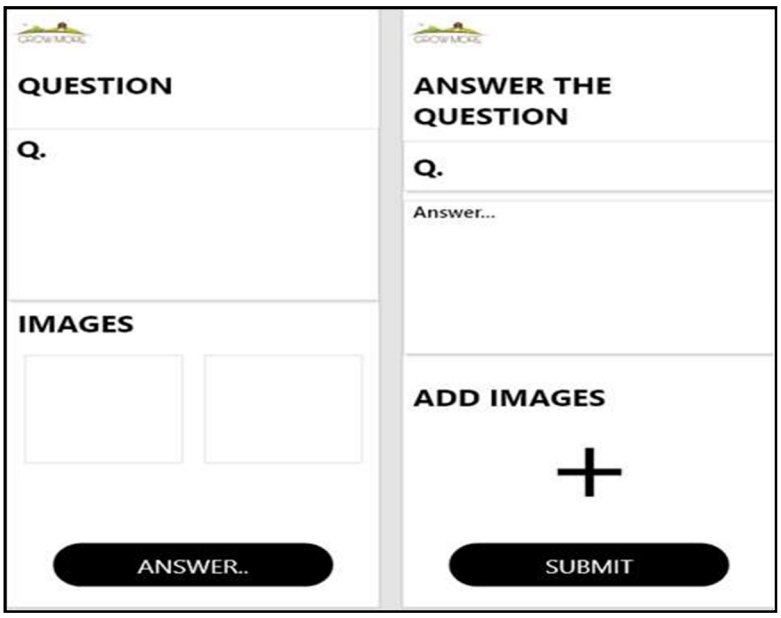



Figure 22. Question- Answer

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4) *Answered Questions*: If an expert wants to see his/her previously answered questions, then they can select "Answered Questions" from the home screen which will redirect to a list of previously answered questions.

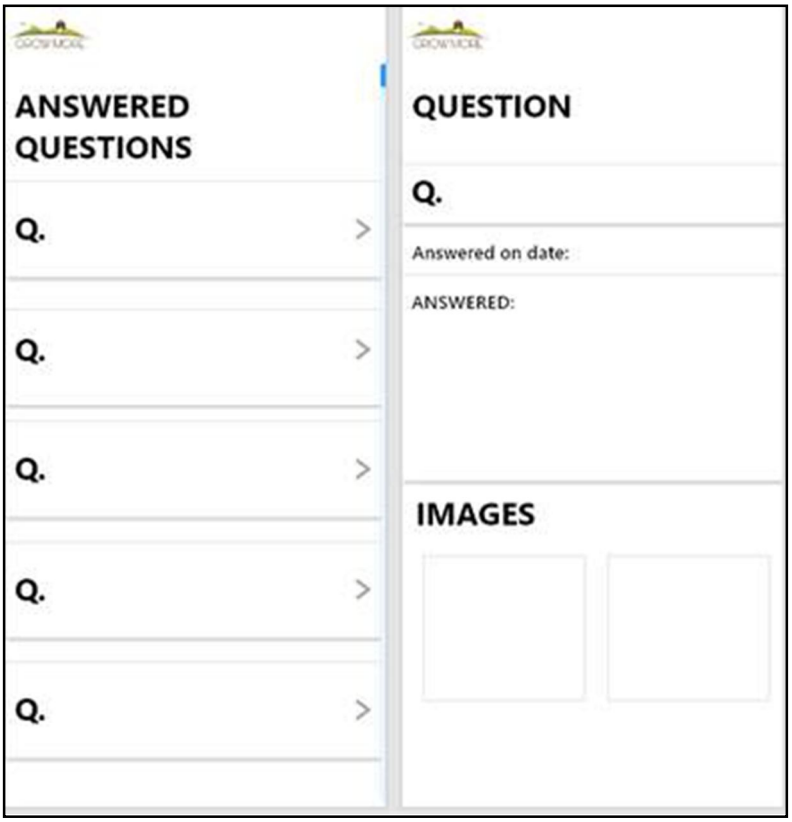



Figure 23. List of all answered questions

## VII. SYSTEM IMPLEMENTATION

The system is implemented using JAVA and XML is used for designing parts. Firebase cloud firestore is used for backend server systems. Adobe XD is used to make wireframes.

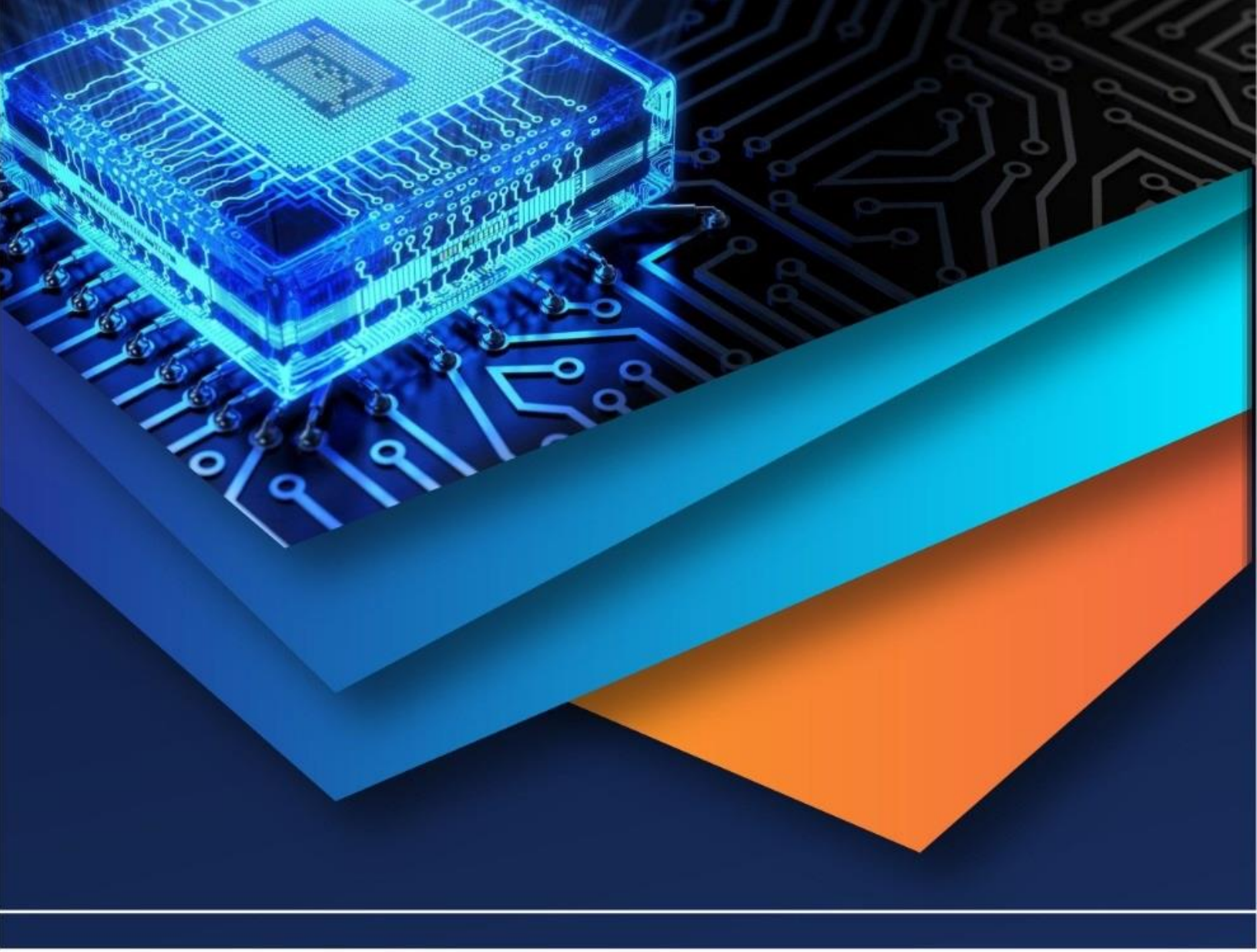
## VIII. CONCLUSION

Thus, the aim of the paper is to ameliorate the problems faced by farmers while selling their production. In this project, I tried to design a platform which will help them get fair prices for their production excluding commissions in between. Also, farmers can get the best possible advice from registered experts. It will help them get proper guidance for any of their queries. This mobile application will not only help farmers get better prices for their vegetables, it will also make the farmer live with pride and make additional income..

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