Design and Implementation of a Mobile Application for Disseminating Information among Nigerian Farmers

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Abstract-Traditionally, farmers in Nigeria, mostly get agricultural information through verbal word from families and friends and this has led to stagnation in agricultural development, as many farmers are not exposed to the latest developments in agriculture. Due to advancements in ICT, there are better ways of disseminating information to large number of farmers instantly. This paper describes the design and implementation of a mobile application for disseminating information among Nigerian farmers, thereby promoting interaction and collaboration. Farmers with access to internet or via SMS can get notifications of vital agricultural information through mobile application.

Keywords-Information dissemination, agriculture extension services, mobile phone, farmers, SMS, Newsfeed

I. INTRODUCTION

Dissemination means to broadcast information to the public without direct feedback, from the audience. Dissemination takes on the theory of traditional view of communication, which involves a sender and a receiver [1]. Farmers usually apply to people who do some combination of raising field crops, poultry or livestock. A mobile application for information dissemination among farmers is an application developed with the Android OS, to disseminate information pertaining to the latest agricultural development and techniques in order to enhance interaction among farmers and also improve farm yields and profits. According to [2], mobile phones were used by 81.4% of farmers interviewed in 6 villages in Akure south and Ifedore Local Government of Nigeria. A total of 150 farmers were interviewed, but only 113 interviews were used for the study. 57.3% of the farmers made use of Nokia phones, while 43.7% made use of other brands including android phones like Samsung, Tecno and Itel. 93.8% of the farmers were willing to receive agricultural extension information via their mobile phones.

II. RELATED WORK

Several approaches to dissemination of agricultural information to farmers have been established in times past. One of such is the development of innovative communication path to disseminate agricultural information and agricultural knowledge through extension agents or agricultural research centres. The advantage of this approach is that farmers can request specific information, since they are communicating with an expert, but this comes with a very high cost [3]. Providing horticulture information via an offline android application is also another approach, but the information easily becomes

outdated [4]. Another medium would be the use of SMS for dissemination of agricultural information. This would mean that even farmers with feature phones can get access to all disseminated information, but the cost of SMS charges presents another problem [1]. Mobile phones are great for information dissemination because most farmers have it, but the issue is that many farmers still don't know how to fully utilize it [5,6]. The paper implements a mobile android application to disseminate agricultural related information to enhance interaction and informal learning among farmers, extension agents, researchers, and other actors in various agricultural value chains.

III. INFORMATION DISSEMINATION AMONG FARMERS

Mobile applications are developed to take advantage of mobile technologies via mobile phones. The benefits of mobile technologies include, but are not limited to affordability, popularity, instant and convenient service delivery, and voice communications [7]. This has led to a worldwide explosion in the number of mobile applications, enabled by the rapid growth of mobile networks and improved mobile phone capabilities. There are various media for disseminating information: Radio, Television, Newspaper, Magazines, Mobile phones PCs etc. Mobile phones are the best medium, because they make use of batteries and can be easily carried anywhere, they also incorporate the features found in other media. According to [2,8], mobile phones were used by very high percentage of farmers interviewed in 6 villages in Akure south and Ifedore Local Government of Nigeria.

IV. SYSTEM DESIGN OF A MOBILE APPLICATION FOR DISSEMINATING INFORMATION AMONG NIGERIAN FARMERS

The main requirement of this system is to disseminate information to farmers that are registered on the system.

This application provides a simple medium for farmers to get up to date information on agricultural advancements in Nigeria as well as information that will be useful to their daily agricultural practices. The use case diagram for the system design is shown in figure 1. The farmers have to register to get access to agricultural information.
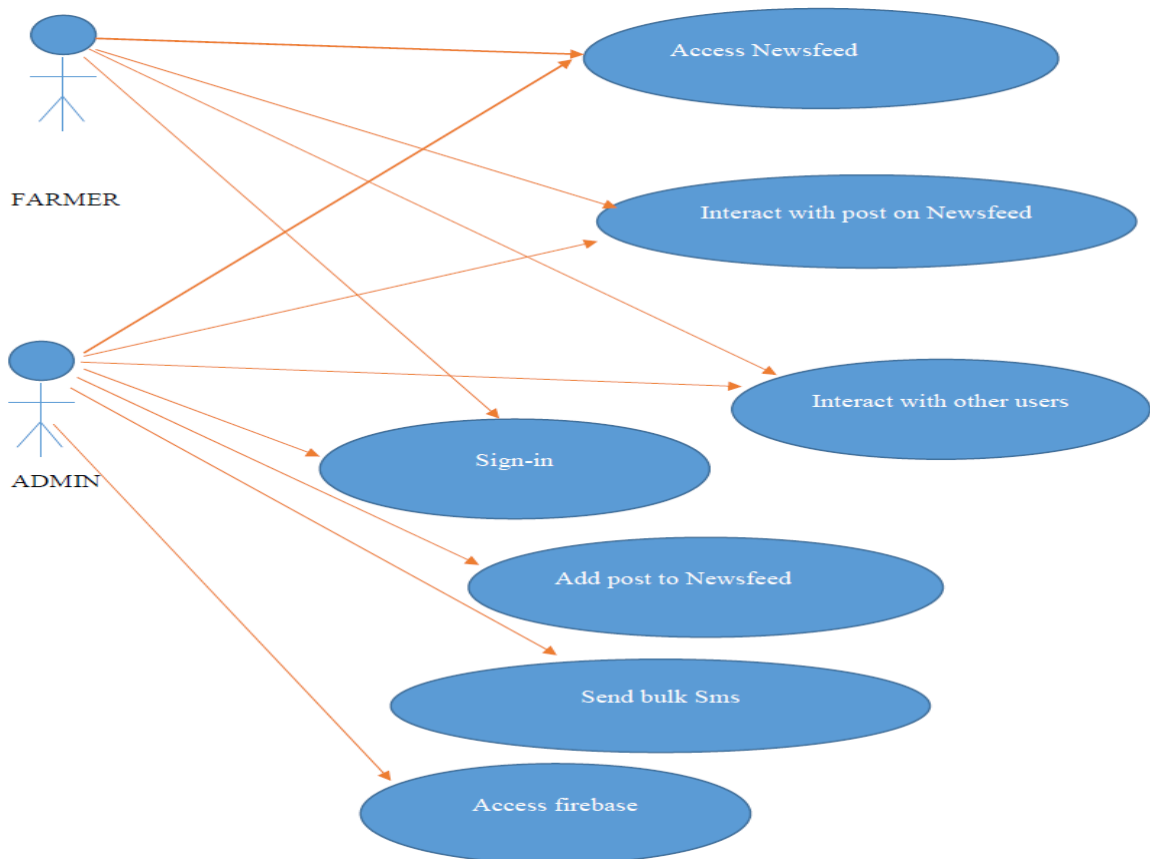

Figure 1. Mobile application design

A. Functional Requirements

1) The system checks if the entered username and password is valid.
a. Input: User enters login details
b. Processing: The system checks if the farmers' login detail is valid. The system authorizes the farmer to access the information on the application.
c. Output: System directs the farmer to the login page if the login details are invalid. System provides farmer with access to Newsfeed on the app and a user profile if login details are correct.

2) Newsfeed
The Newsfeed will allow the user to view all the agricultural information on the app and interact with other farmers as well as the posts. The system will display all information on a news feed in chronological order with options to like, comment or share a post to other social media platforms. Users will be able to like posts by hitting the like button. Users also will be able to interact with other farmers and posts by hitting the comment button.

B. Non-Functional Requirements

1. Consistent uptime
   The system will stay up running at least 98% of the time. Any downtime would be due to maintenance or upgrades.
2. Load and concurrency
   The system serves up to ten thousand users concurrently without crashing.
3. Simple Interface
   The system has an interface that can easily be used by any users.
4. Auto-Update
   The system refreshes new information automatically on the news feed.
5. Focused Layout
   The new system reduces the potential for confusion by having a focused layout. This means that it displays information that is relevant to the current task and conversely, leave out irrelevant information.

6. Dealing with large quantities of data

The developed system will deal with large quantities of data and a large number of users accessing the data at once.

V. SYSTEM IMPLEMENTATION

This application was developed on the android platform making use of the Intelli-j based ide known as android studio. The backend functionality was developed using the android SDK (Standard Development Kit) and Java, while the UI (User Interface) was designed using xml all on android studio. The database management and user authentication were implemented using Google firebase. This is because, Google firebase is efficient, robust and seamlessly interfaces with android platform. It is also platform independent. This means that android, i-OS, and web applications can make use of a single database.

A. The Login Activity

For a new user, the login activity is the first page the user encounters. At the bottom of this is a button to register. Without registration, the user cannot access the system functionalities. Registered users will enter their email and password. If the correct details are entered, the user is taken to the Newsfeed, where they can access agricultural information and interact with other registered farmers. If on the other, the details are incorrect or the input fields are empty, an appropriate error message is displayed via a Toast. A toast is a message mechanism that displays a short message when triggered and disappears after the set time. Internet connection is required for this activity see (figure 2).
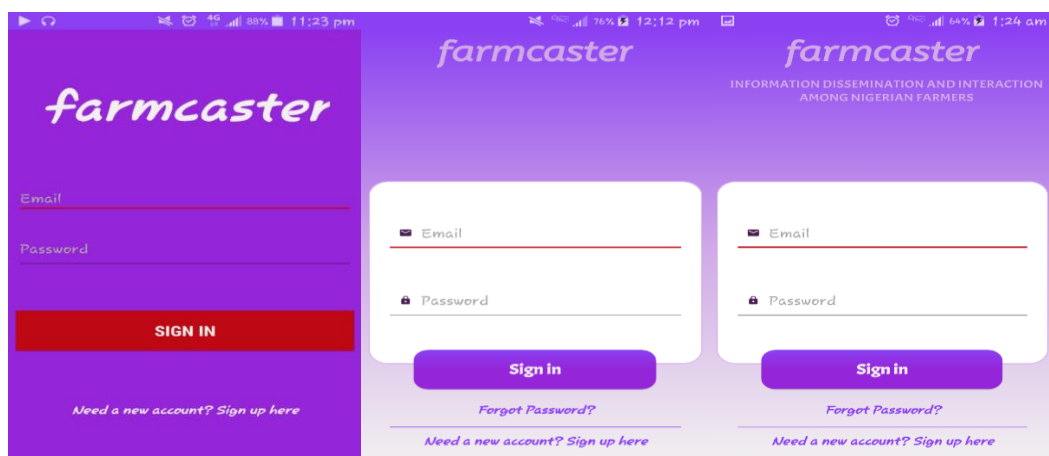

Figure 2. Initial and final design of login activity

B. The Registration Activity

New users need to register on the platform to access its functionalities. The registration activity can be accessed via the 'Need a new account? Sign up here' button at the bottom of the of the login activity. The Registration activity has three input fields namely; Email, Password and Confirm Password. The purpose of this activity is to collect information from the user that will be used for authentication. Some checks have been put in place to make sure the user enters a well-formatted email as well as making sure the user knows their password. When the user hits the 'create a new account' button, the inputs are validated and the user is taken to the Setup Activity. Internet connection is required for this activity (see figure 3).
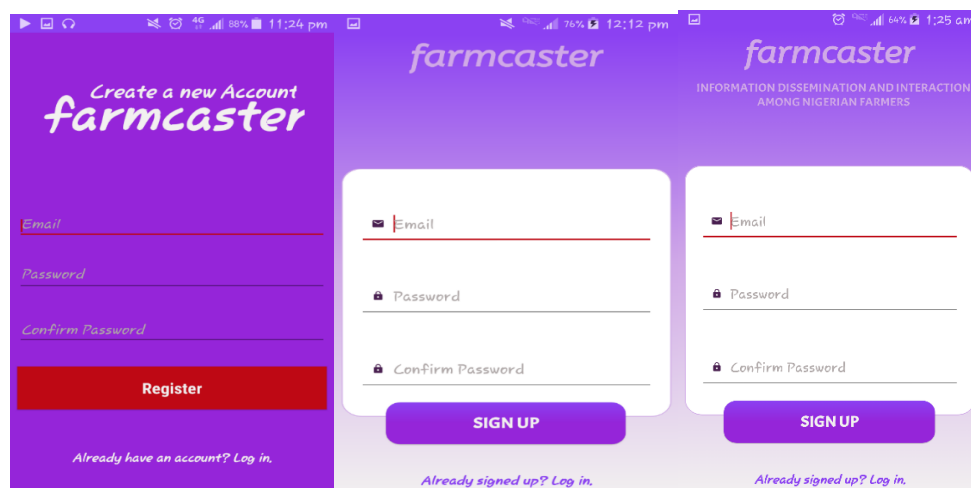

Figure 3. Initial and final design of registration activity

C. The Setup Activity

In this activity, the user gets to upload their picture and enter their name and area of specialization. These details will make up the user profile of the farmer. When the user hits the 'Save Account Details' button, the input fields are checked to ensure none is left empty and the images are sent to the firebase database and saved. The user is then sent to the Newsfeed Activity(see figure 4).
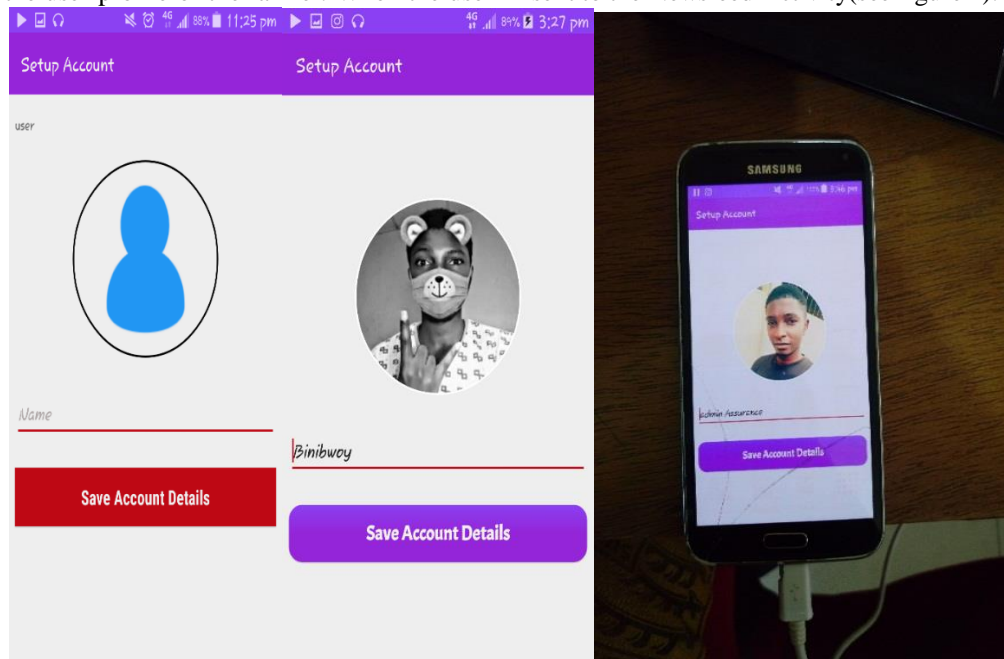

Figure 4. Initial and final design of setup activity

D. The Newsfeed Activity

This is the main function of this application. All information can be accessed on this activity. The information is presented in a newsfeed format akin to that of Facebook. Under each post is a comment button where users can interact with the post and with each other, a like button and a share button to share the post on other social media platforms. At the top right section of this activity is the search button and menu button. With the search button, the user can search for any particular information by entering keyword. The menu button when clicked will display 'my profile', 'sms notification' and 'logout' options. The logout option logs the user out of the application and sends the user to the login activity (see figure 5).
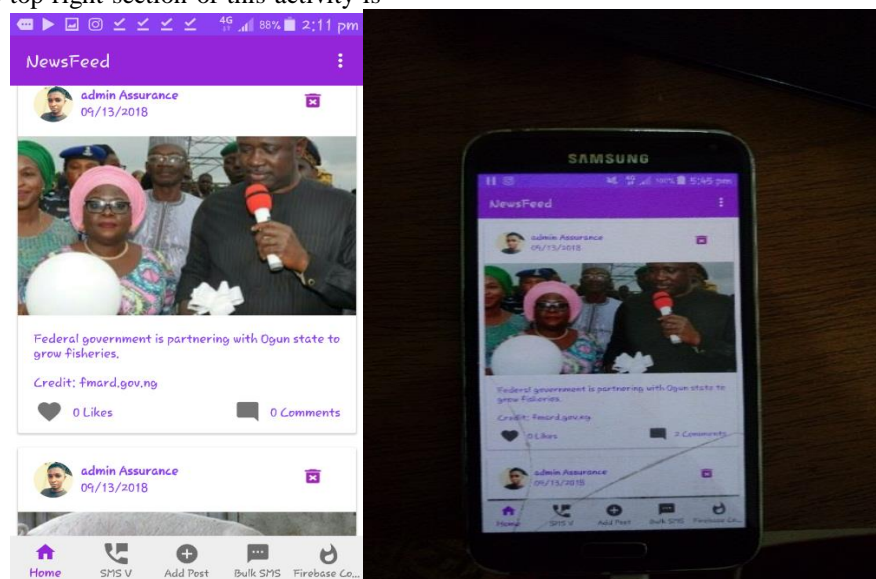

Figure 5. Newsfeed activity

E. The User Profile Activity

The user profile contains all the details of the current user. These details include profile image.name, email, and area of specialization. All these details can be modified by the user at any time (see figure 6).
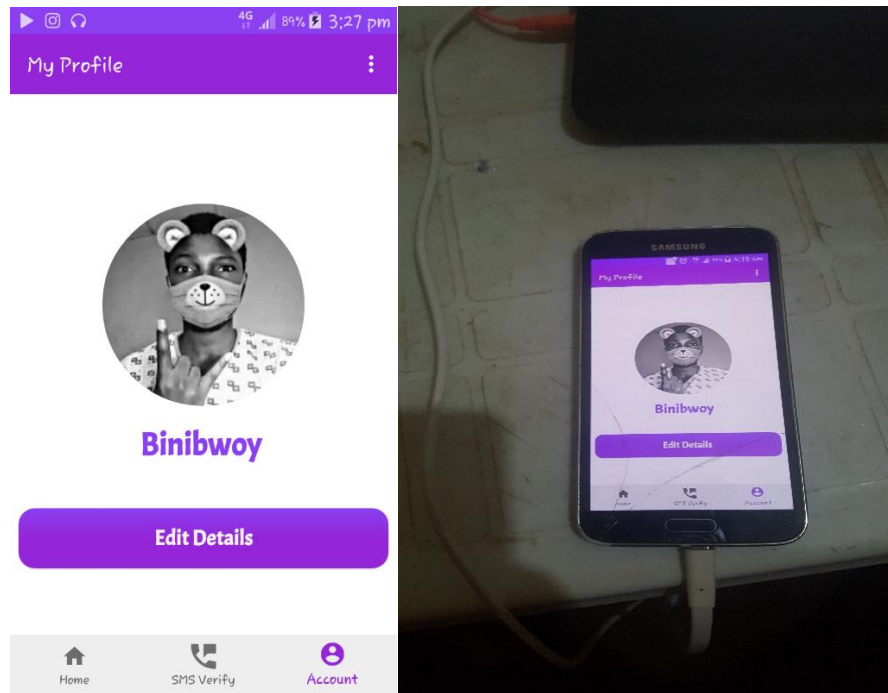
Figure 6. User profile activity

F. The SMS Notification Activity
The SMS notification activity is the section where users can opt to receive posts via sms or register a fellow farmer that doesn't have access to an android phone or the internet.

In this activity, there is a text field where the user enters the phone number they intend to register. When the user hits the 'Register Phone Number' button, a confirmation code is sent to the phone number and the user has to enter the code that was sent on a new activity called the 'Verify Phone Number' Activity (see figure 7).
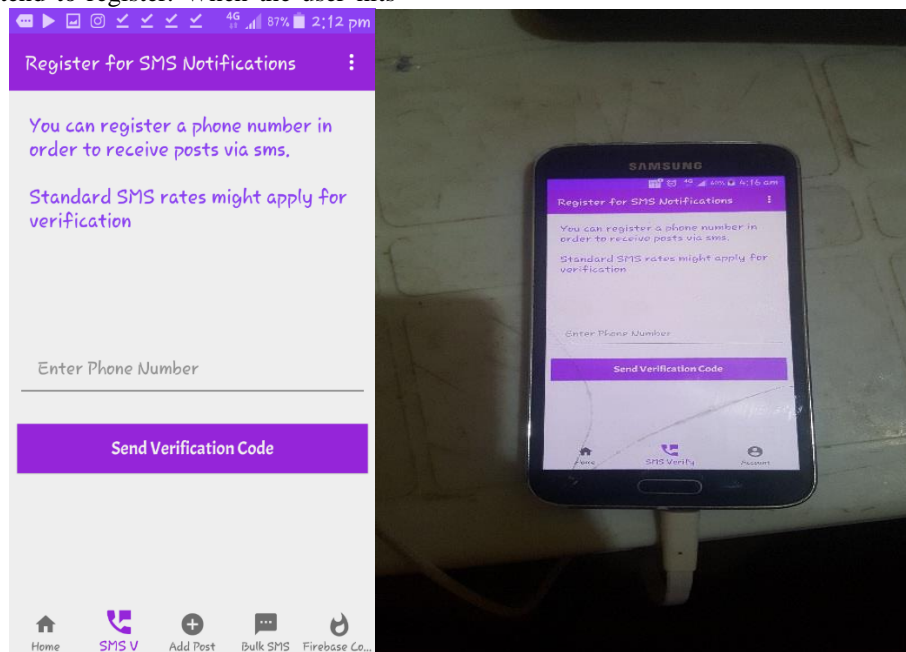

Figure 7. SMS register activity

G. The Verify Phone Number Activity
This is the activity where the user enters the verification code that was sent to them. If it is correct, a success message is displayed and the user is redirected to the Newsfeed Activity. If on the other hand there is a failure, a retry message is displayed. After 5 unsuccessful retries. The user is redirected to the Newsfeed activity (see figure 8).
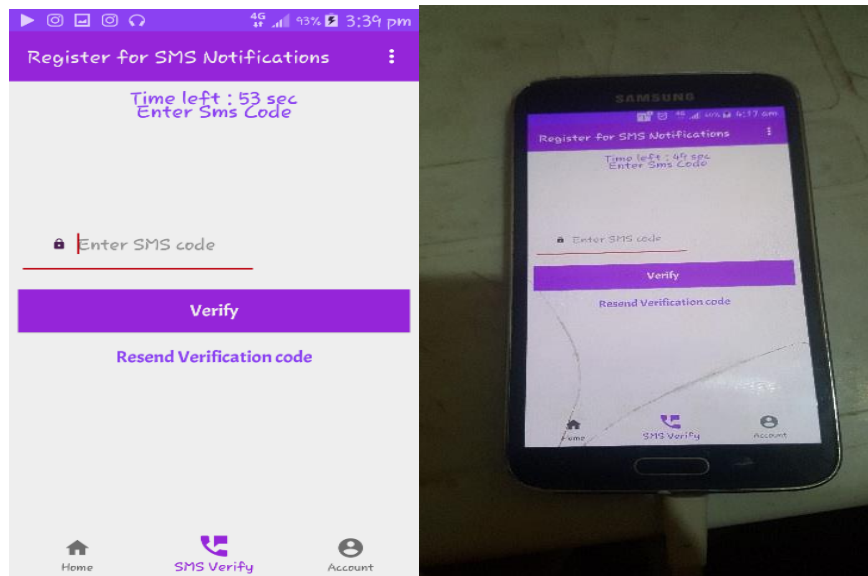
Figure 8. SMS verification activity

H. The Comment Activity

Here, farmers can interact with post and also with other farmers. All they need to do is enter their message in the text box and press send. Admin can delete any comment but users can only delete theirs (see figure 9).
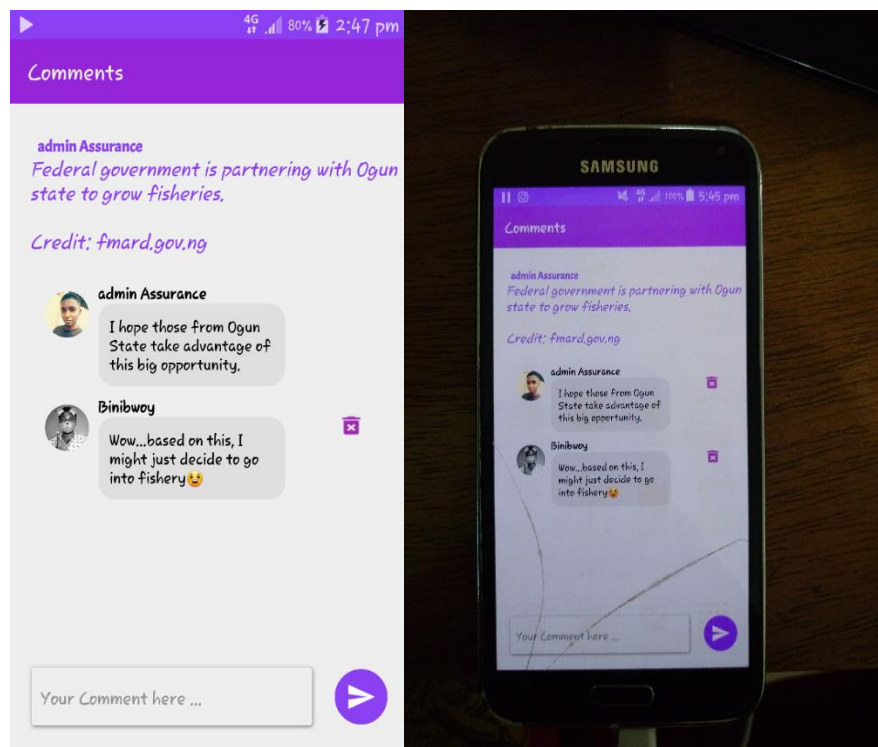

Figure 9. Comment activity

I. The Add Post Activity

This activity is only accessible to the admin. Here, the admin enters the post text into the text box and enters an image. Then the admin has to press the "post" button and the post is sent to the firebase database and the admin is sent to the newsfeed where the new post has been added (see figure 10).
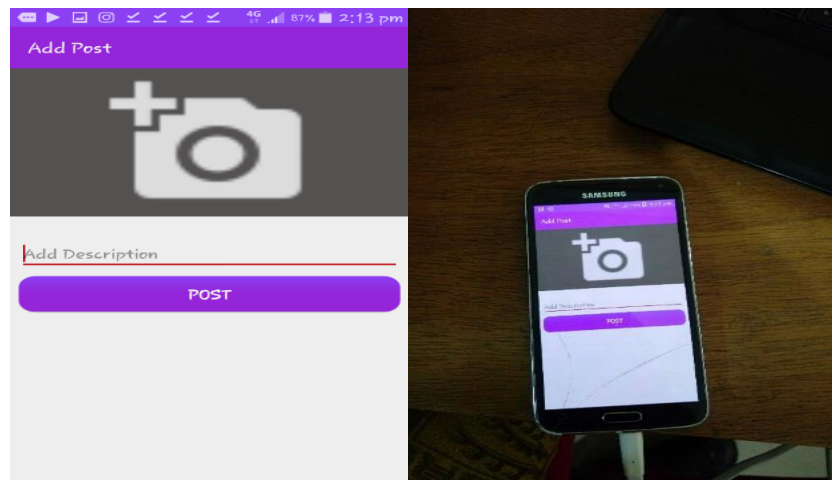
Figure 10. Initial and final design of setup activity

J. The Bulk SMS WebView Activity
This activity is only accessible to the admin. Here, the admin sends agricultural information to all registered phone numbers on the database. One sms costs 0.76kobo per sms. And one SMS is defined as 160 non null characters (see figure 11).
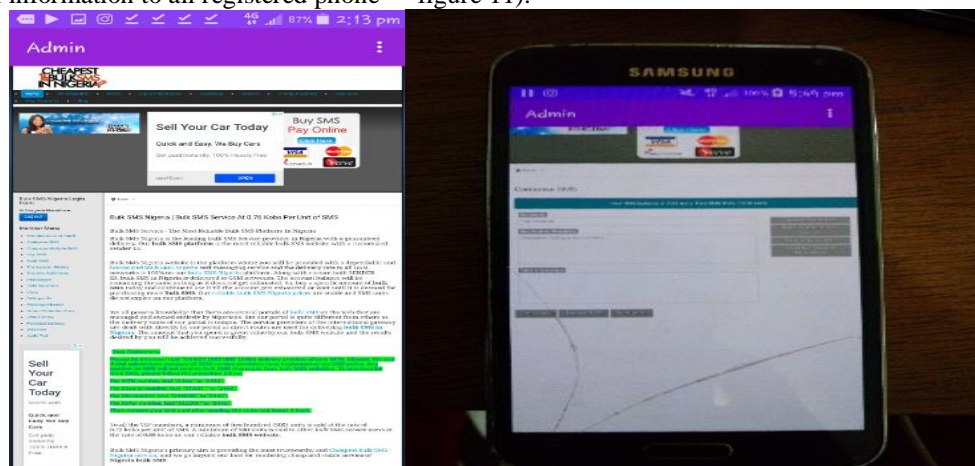

Figure 11. Bulk SMS activity

K. The Firebase Platform Activity
Here, the admin can manage account users and information via firebase firestore library. User authentication is also done via firebase authentication library. Also, media files are stored on firebase via firebase storage library. The admin can also send periodic notifications to users and view app usage analytics (see figure 12).
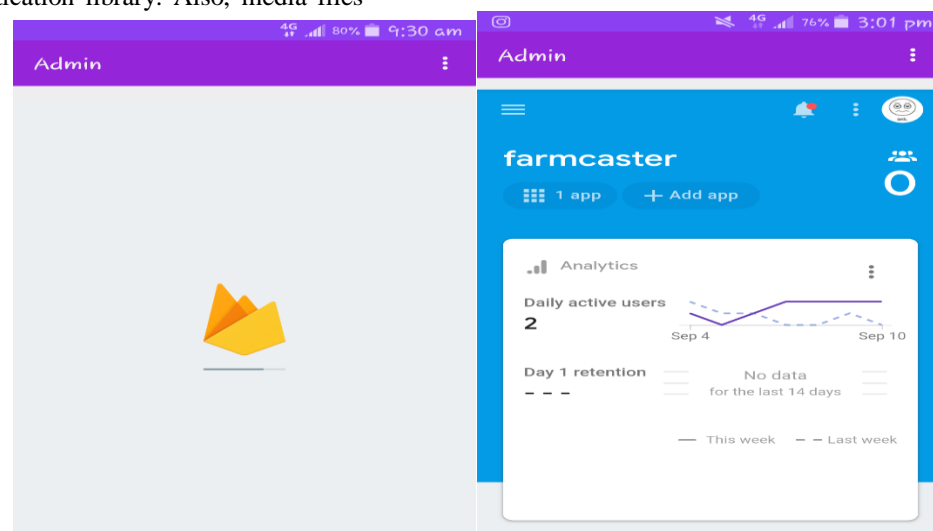

Figure 12. Firebase analytics activity

L. The Livestock Activity

This is an offline activity where the user can view pre-loaded information on common livestock reared in Nigeria. If the user has any more inquiries, they can visit

the link at the bottom of the activity or interact with the admin on the comments section of the Newsfeed (See figure 13).
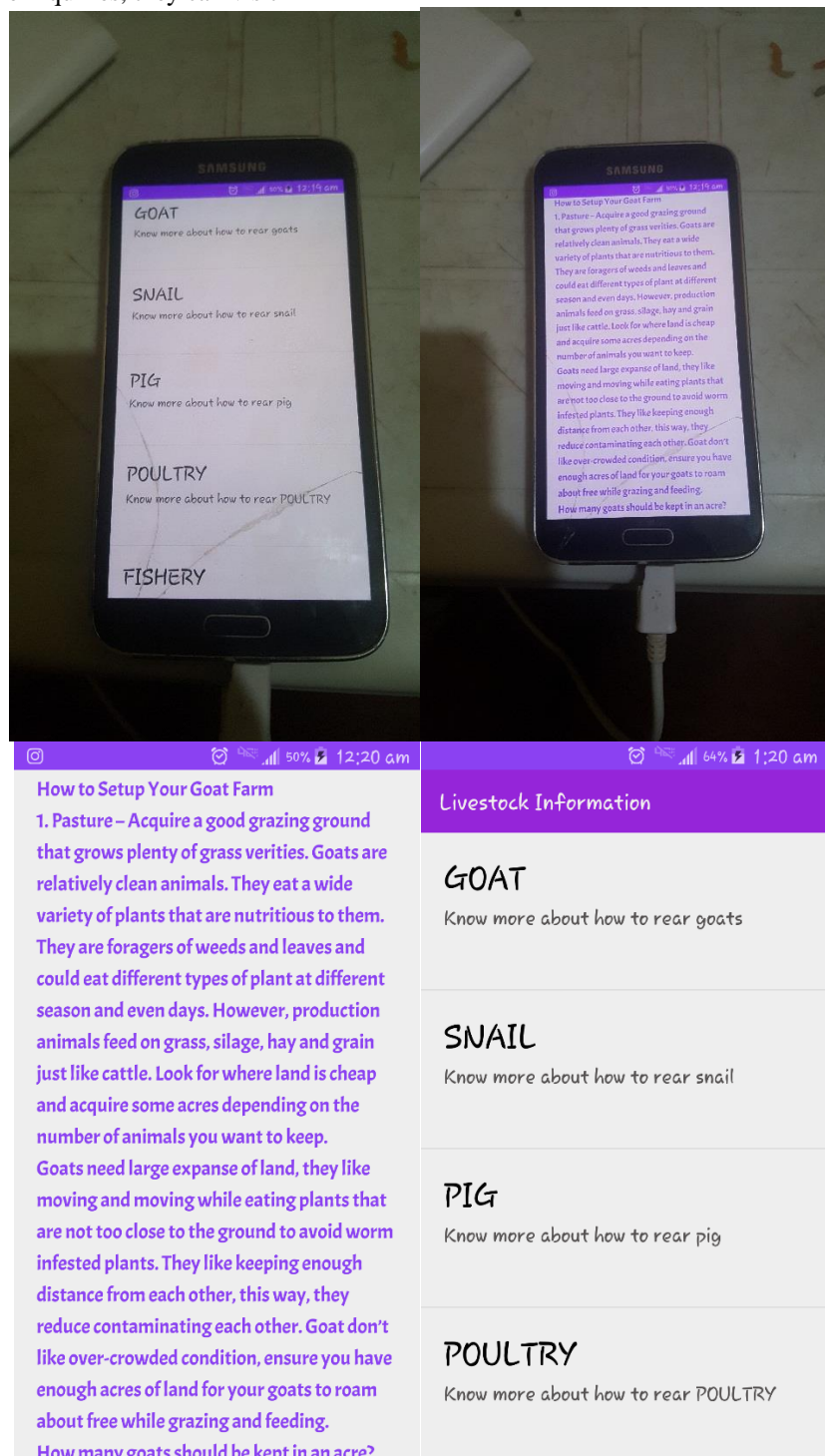

Figure 13. Livestock activity

V. CONCLUSION

A Mobile Android application has been developed which will help in disseminating information to farmers thereby enhancing interaction among farmers and also improve farming in Nigeria. The conclusions drawn on the major

features of the system includes: Availability of pertinent agricultural information to farmers that own either android phones or feature mobile phones. Authentic information is made available, as the source of information includes government websites and reliable agricultural websites. The

application also serves as a means of meeting other farmers via interaction on the newsfeed of the application.

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