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Free Applications for Monitoring Agricultural Activities in the Republic of Croatia

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Abstract

The use of technology and modernization is becoming increasingly popular in agriculture, and with that comes agricultural applications that aim to simplify agriculture, increase yields and reduce consumption. Through this paper, I will investigate the demand and popularity of applications, which applications are the most popular in in Croatia and which ones in the World, the differences between different applications, their advantages and disadvantages, how to use them and the knowledge needed for their use. The paper specifically discusses highlighted free applications that are more attractive simply because they are free to everyone. However, free can be a great option or a very bad option, just like with free software. Many free programs contain viruses, malicious software that can potentially take your data. However, free applications for monitoring agricultural activities offer a number of advantages farmers as well as tools for monitoring agricultural activities without financial burden.

Summary: *The use of technology and modernization is becoming increasingly popular in agriculture, and with it come agricultural applications aimed at simplifying agriculture, increasing yields and reducing consumption. Through this work, I will explore the search and popularity of applications, which are the most popular applications in Croatia and which in the World, the differences between different applications, their advantages and disadvantages, the manner of use and the necessary knowledge for their use. This paper especially highlights free applications, which are therefore free for everyone and more attractive. But for free it can be a great but also a very bad variant as with free software. Many free programs contain viruses, malware that can potentially take your data. But free applications for monitoring agricultural activity provide a number of benefits to farmers and as well as tools for monitoring agricultural activities without financial burden.*

Objective of the Work: *The goal of my work was to explore free applications for monitoring agricultural production, their availability, practicality in use as well as their advantages and disadvantages. The aim of the work is to encourage farmers to start using the applications available to them to make it easier for themselves agricultural production. We have also highlighted free applications to make it even more encouraged farmers to use it because they only need to invest time and not money.*

Keywords: Precision Agriculture, Agricultural Activity Monitoring, Mobile Applications, Digital Farming.

Introduction

Agriculture is a very complex branch, despite the fact that many people underestimate it, in order to have for proper and successful production, we need a lot of knowledge, work and time spent in the entire process. People used to do everything themselves without any help from technology, most often they were just

man and machine, or rather tractor. Given that agriculture and its products are in high demand and production had to be increased due to increasing demand, it was impossible for farmers maintaining it all on their own regardless of the amount of help they receive.

Over time, man began to gravitate towards technology and its assistance in doing tasks or providing certain information. This is how applications were created that help farmers in many ways. Some applications are used for self-organization and documentation of one's own production, some serve as a public platform where various questions and concerns can be raised and each question and answer can remain public so that all users can see if they have same problem.

We also have many applications that use GIS/GPS technology that will prove as the most successful and one of the most useful. With it we can determine the growth stages of crops, the type soil and weather conditions, we can also control irrigation systems, including water consumption and soil moisture levels, spatial analysis and mapping. Such technology allows farmers to monitor and manage their crops and land.

The use of GIS technology is very widespread and beneficial to farmers. There are applications with which we can even operate tractors and machines, which would mean that man would no longer doesn't have to be behind the wheel and operate the machine.

Agricultural Industry in Croatia

Agriculture includes crop and livestock production, aquaculture, fishing and forestry for food and non-food products. Croatia has approximately 1.5 million hectares (ha) of utilized agricultural land and 2.8 million ha of forests. Croatia has favorable conditions for diversified agriculture, but is self-sufficient only in the production of wheat, corn, oats, barley, main oilseed crops, mandarins, cherries and sour cherries [1].

The main sectors of the agricultural industry in Croatia include the cultivation of cereals, fruits, vegetables, vines, olive trees, livestock, fishing and aquaculture. Agriculture is based on traditional farming methods, but the application of modern technologies and approaches is also increasing, such as precision irrigation, sensor usage, digital farm management and tracking breeding activities through applications.

However, the agricultural industry in Croatia faces various challenges, including: fragmented land ownership, lack of capital and technological infrastructure, aging rural population and adaptation and harmonization with European standards and regulations.

Agriculture, especially farming, remains a dangerous industry, and farmers across the world are still at high risk of work-related injuries, lung disease, hearing loss noise-induced, skin diseases, as well as certain types of cancer linked to the use of chemicals and prolonged sun exposure [2].

The Government of the Republic of Croatia continuously implements measures to support agriculture and rural development. development to boost the competitiveness and sustainability of the sector. In this context, free agricultural activity monitoring applications can provide farmers with tools for better farm management, crop monitoring, irrigation planning, cost optimization and improving production efficiency [3].

Efficient Monitoring of Agricultural Activities

Monitoring agricultural activities allows farmers to better manage resources such as soil, water, fertilizers and pesticides. It also allows for optimization of quantity and time application of these resources, which can result in cost savings and reduced negative impacts on the environment.

Productivity is improved because it allows farmers to monitor crop growth and development, identify potential problems and take appropriate measures in a timely manner. In this way, effective monitoring can help increase productivity and crop yields. Also allows finding relevant information about crop condition, weather conditions, market trends and other factors affecting agricultural production. Then better planning of activities, making informed decisions and adapting farming methods to achieve optimal results. More effective monitoring can contribute to improving the quality and food safety. Farmers can monitor fertilizer and pesticide applications, conduct testing soil and crops and monitor all steps in food production to ensure they meet high quality and safety standards. Such a system for monitoring agricultural activities enables farmers to comply with legal regulations and standards, including regulations on environmental protection, food safety and animal welfare. This reduces the risk of sanctions and improves the reputation and trust in agricultural products [4].

Overall, effective monitoring of agricultural activities contributes to sustainability, competitiveness and modernizing the agricultural industry and enabling farmers to make better use of available resources and achieve optimal results in food production [5].

Figure 1: GIS technology

Free applications for monitoring agricultural activities provide a number of advantages to farmers in the Republic of Croatia, some of which are accessibility and low price, which allow farmers to use useful tools to monitor agricultural activities without financial burden.

They do not require high purchase or subscription costs, making them affordable and suitable for everyone farmers, regardless of size or financial capabilities. Farmers can better and manage and organize your farms more conveniently.

They can track work tasks, record and analyze crop data, manage inventory, and resources and plan activities according to weather conditions. One of the great advantages application is the ability to precisely monitor the growth, development and health of crops via sensors, GPS and other technologies.

Farmers can monitor soil moisture, temperature, pH value and other parameters to ensure optimal conditions for plant growth. They can also monitor the use of resources such as water, fertilizers and pesticides for efficient management. A very important item for all farmers is tracking expenses, investments and income, and using applications they can keep records of financial transactions, tracking invested funds, and calculating crop profitability. This helps them make informed decisions and plan their budget. Free apps for monitoring of agricultural activities can be adapted to specific local conditions and crops grown in the Republic of Croatia. They can provide information about local agricultural practices, planting calendar, crop varieties and other relevant information. Some farmers may encounter problems in their production and applications can help. Through them, they can consult with others who may be more experienced. farmers, experts and institutions. The main goal of the application is to reduce manual work farmers, i.e. administrative tasks. For example, they can automatically generate reports, records of working hours, invoicing and other administrative tasks. This saves farmers time and allows them to focus on other important aspects of the business [6].

The following (non-functional) requirements are also listed as key features for modern smart agricultural applications in developing regions:
Offline availability: The app should continue to work whenever a network connection is available. becomes unavailable. The application should use a client-side database for local storing data on the mobile device while waiting for the network connection to be re-established.

Reactivity: The application should react to events originating from the external environment.
real-time environments. Also, the application should support the generation of relevant notifications as soon as sensor data is received to motivate agricultural decisions, e.g. misting crops when temperatures exceed certain thresholds.

Reconfigurable: It should be possible to change and adapt existing application components to suit different scenarios after initial development. On For example, it should be possible to change the data collection research to meet data collection requirements for different agricultural seasons or crops.

Extensibility: It should be possible to add new features and services to the application after implementations, e.g. by supporting application programming interfaces (APIs) or components reusable. Based on these requirements, our goal was to gain insight into application development for smart agriculture for small farmers in developing regions. Considering all these advantages, free applications for monitoring agricultural activities provide farmers with useful tools to improve management, increase productivity, reducing costs and achieving better results in agricultural production [7].

Methodology of Work

Methodology is a systematic approach or set of procedures, techniques and tools used to conduct research. research, study or approach to a field of knowledge. It provides guidelines and structure for organization, implementation and analysis of information to achieve specific goals. Methodology is used in various fields, including scientific research, software development, project management and education [8].

Research methodology may consist of identifying research objectives such as identification of relevant free applications, analysis of their functionalities and evaluation their applications in agriculture. After identification, data collection on free applications follows. This can include searching online sources, studying available applications on platforms such as the Google Play Store or App Store and contacting institutions or farmers for recommendations.

We can also analyze the functionality of applications, which includes a detailed analysis functionalities and possibilities of monitoring agricultural activities provided by the applications. This includes studying their features, interfaces, supported platforms, integrations with other systems or sensors and the availability of localized information for agriculture in the Republic Croatia.

Using application evaluation, we compare functionality, interface intuitiveness, user experience, support and ratings from other users.

This may include case studies or interviews with farmers who have used certain applications and achieved positive results in monitoring and optimizing agricultural activities.

Through analysis, we can notice some of the advantages and challenges of using free applications. for monitoring agricultural activities in the Republic of Croatia.

Finally, we have recommendations that are made based on the identification of key needs. farmers. This may include identifying key needs of farmers, recommending the most suitable applications for certain types of agricultural activities (e.g. growing vegetables, fruits, livestock) and recommendations for optimizing the use of applications, user training and possible challenges that need to be taken into account. Also, by means of a final conclusion or summary The entire research highlights the potential for further development and improvement of applications such as would better respond to the specific needs of farmers in the Republic of Croatia [9].

Identification of Relevant Free Applications

Searching for applications is often the most complicated and takes the longest. Future application users they must first inquire and inform themselves about the applications, their use and their purpose and whether the application has the features that the future user is looking for.

Today, the most common way to research applications is through online sources such as websites. pages, forums, blogs and portals dealing with the topic of agriculture in Croatia. Many of them provide information on useful applications and tools for monitoring agricultural activities. Application download platforms can serve as one source of information. Browse the Google Play Store for Android devices and the App Store for iOS devices. Use keywords like "agriculture", "crop monitoring" or "agricultural apps" can help you find free apps that are popular or recommended by user.

As much as online research is much simpler, more practical, and sometimes easier today, can create a problem due to the excessive amount of information and also the different ones. In some In some cases, a better solution might be to contact agricultural institutions such as Ministry of Agriculture, agricultural associations, local agricultural services and advisory agencies. They can provide information about recommended free applications which are available to farmers in the Republic of Croatia [10].

Also, perhaps the best information we can get from agronomic experts is information from experienced people who are familiar with this issue and can perhaps give us the most accurate information. They may have information about relevant free apps and their application in the Croatian agricultural sector. Agricultural fairs and events can also serve as a source of information. Visiting agricultural fairs, conferences or events dedicated to agriculture. These events often include an exhibition of innovations in agriculture and can provide an opportunity to learn about different applications and technological solutions [11].

It is important to conduct detailed research and check user feedback and ratings before downloading and using any application. It is also useful to consult with farmers or experts who already use applications to gain practical recommendations and first-hand experiences.

Overview of Free Applications for Monitoring Agricultural Activities

There are many free applications for monitoring agricultural activities available on market and each application has its own advantages and disadvantages, so it is important to conduct a detailed analysis before we decide to use any application. Some of the most popular applications FarmLogs is a crop management application that helps farmers track weather conditions, planting planning, yield monitoring and financial management.

AgroDox is an innovative digital platform that makes it easy to organize and track agricultural documents and records, provides farmers with an effective tool for centralized document management and reduction of administrative burden. Agroklub which is one of the most popular applications in Croatia, it offers news, advice and information related to agriculture, as well as the opportunity to communicate with other farmers. Also offers various tools for monitoring agricultural activities, including a work calendar, monitoring crop conditions, fertilizer and pesticide use, and weather monitoring. These applications are just some of the many that are available to farmers in the Republic of Croatia, so we highlighted the most important.

Agroclub: Agroklub is one of the more popular agricultural applications in the Republic of Croatia. Founded was founded in 2006 in Osijek, where it is currently headquartered, by the company Agroglas doo. Founded by Danijel Koletiÿ and Zlatko Gavriloviÿ, the app offers news, tips, and information. related to agriculture, as well as the opportunity to communicate with other farmers. Also offers various tools for monitoring agricultural activities, including a work calendar, monitoring crop conditions, use of fertilizers and pesticides, and monitoring meteorological conditions.

Agroklub also offers an e-marketplace for the sale and purchase of agricultural products, tools for financial planning and accounting, as well as farm and livestock management tools. Agroklub has not published official statistics on the number of downloads and usage of the application. due to data confidentiality. However, according to data from the Google Play store (for Android version), the Agroklub application has been downloaded more than 100,000 times and has an average rating of 4.2 stars based on more than 2,800 reviews. This data shows that Agroklub is popular application among farmers in the Republic of Croatia and that it has satisfactory user experience experience. Agroklub is also present on social networks such as Facebook, Instagram and Twitter, indicating active engagement with users and the wider farming community.

Users are also very satisfied with this application for its information and tools. planning, its simplicity and the possibility of communication with other users...

Some of the user comments:

- "This app is very useful and educational. It contains a lot of information and tools that help me they help in planning and managing my crops. I recommend to everyone farmers!" - a user from the Google Play store
- "A great app for all farmers. Contains everything you need to monitor your work on the farm and successfully raising plants and animals." - App Store user
- "The application is very useful and easy to use, and also offers the possibility communication with other farmers. Sometimes the application is slow to load, but otherwise I'm very satisfied." Google Play Store user
- "Agroklub is a really great app. It helps me manage my farms and livestock, and also has great news and advice about farming. I highly recommend it to everyone farmers!" - user from the App Store (Google Play Store)

Agroklub is a popular application that has many advantages such as tracking capabilities weather conditions. The application provides information about weather conditions in real time, which allows users to monitor and plan agricultural activities. It contains many information on agronomy, livestock farming, crop farming, fruit growing, viticulture and other in the fields of agriculture, which allows users to access high-quality information and advice. It enables connections with other farmers, exchange

of experiences and advice and cooperation in various aspects of agriculture. It provides opportunities to track information about prices of agricultural products and inputs, which allows users to monitor market conditions trends and make informed decisions about sales and purchases. It allows for easy tracking agricultural activities, such as planting planning, monitoring crop and animal health, monitoring input consumption, etc. One of the biggest advantages of Agroklub is that it is free to use, which is especially important for small farmers who cannot afford expensive software and tools for monitoring agricultural activities.

Of course, no application is perfect and each has some flaws and shortcomings, for Agroklub some of the disadvantages are slowness and irregular data updates; some users have noticed that the data in the application is slow to update or is incorrect, which can cause errors in planning of agricultural activities. Although the application covers many areas of agriculture, some users find it lacking functionality in certain areas, such as livestock management. Problems with reporting and registration, which can cause frustration and waste of time. Lack of personalization and customization options their specific needs. In addition to the aforementioned shortcomings, it is important to note that the Agroklub application is regularly updated and improves, and that the development team is working on removing defects and improving functionality.

Agroklub is most commonly used in Croatia, as it is an application developed for Croatian farmers. farmers and contains information relevant to agricultural conditions in Croatia. However, the application is also available in other countries and can be used in any country where relevant data is available. Agroklub is particularly used among small farmers, but also to larger farms looking for simple monitoring tools agricultural activities and access to useful information. The application is also popular among those involved in agritourism and the sale of agricultural products.

Agroklub is available on the web and as a mobile application for iOS and Android devices. The application is free to download, but also offers premium content for which you pay a subscription, today it has a large community of farmers who use this application in the Republic of Croatia and the region.

Figure 2: Use of satellite technology

AgroDox: AgroDox is a free Croatian mobile application for monitoring agricultural activities, which Zagreb-based company Intertim doo was publicly presented on Tuesday, November 10, 2019 at conference "Digital Agriculture" held at the Faculty of Agriculture of the University in Zagreb. The application is available on all Android and Apple mobile devices.

AgroDox is an application intended for all farmers, and will allow them to do so for free and simple management of all activities on their farms, especially related to soil cultivation and cultivation of agricultural crops with the possibility of setting weather conditions reminders, and entry and financial management of expenses.

In addition to monitoring agricultural activities, the application also offers other tools such as agrometeorological forecasts, fertilization and sowing calculators, and conversion of area and volume units. Through The gamification system will allow users to complete interesting quizzes simply find out your current position and align your agricultural practices with legislative framework and good manufacturing practice, which aims to start individual the possibility of simple consultation. The application also contains information such as news from agribusiness, information about new projects, innovations, national and European projects and simple and concise information on how to grow various crops, fruits and vegetables, intended for beginner farmers. All the listed features of this application are also advantages However, one of the main benefits of this application is the ease of use of this application, which is made specifically so that all generations of farmers can use it, so For example, registration is done in just three steps; 1. in the settings, select registration, 2. fill in necessary information, 3. choose a password. (Agroklub(https:// komora.hr) Story (https:// story.

AgroDox, like all other applications, has its drawbacks, such as the need for internet access. using the application, there may be inaccuracies in data and weather forecasts... However, the application is very useful and these few shortcomings are not a big problem.

The application is still being developed and regularly updated, and some of the goals for the future are the possibility simple advice, solving short quizzes that will educate users on interactive way, and also show them their position in relation to other users. In The plan is to connect it to new technologies such as "Internet of Things" sensors, weather stations, a 5G network that will further facilitate, but also encourage, the development of the IT sector, and thus Agrodox applications. (Agroklub (agroklub.com))

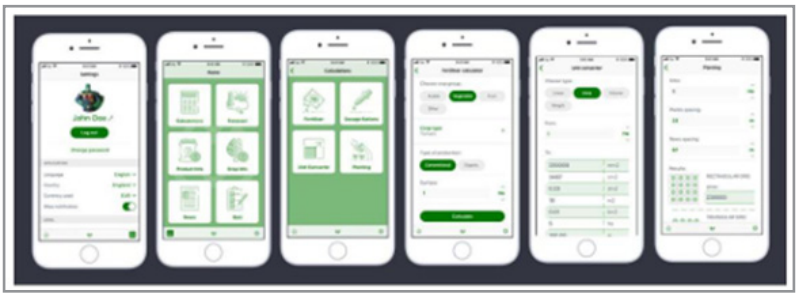

Figure 3: AgroDox application

FarmLog: FarmLogs is an American company that develops software for monitoring agricultural production. The company was founded in 2011 in Ann Arbor, Michigan, USA. The company's founders are Jesse Vollmar and Brad Koch, and the idea for founding the company came from their experience in family farm. Since then, FarmLogs has developed into one of the leading companies developing digital tools for agriculture in the United States, and has expanded its presence expanded to the international market. FarmLogs also received positive reviews from farmers and experts in the agricultural industry due to its ease of use, useful functions and capabilities for collecting and analyzing crop data.

Although FarmLogs is an American company, the application they offer can be used in any country world, including Croatia. However, it is important to note that the FarmLogs application has emphasis on monitoring the production of crops most commonly grown in North America, such as corn, soybeans, wheat, sunflowers, etc. Therefore, some functions of the application, such as the harvest calendar or crop planning, may not be applicable to agricultural conditions in Croatia.

Despite this, FarmLogs offers a number of useful features for farmers in Croatia, such as: monitoring crop growth and development, managing inputs and costs, monitoring weather conditions, and crop data collection and analysis. FarmLogs also offers a mobile app that allows farmers to monitor their crops directly in the field, which is especially useful for those who have multiple plots in different locations.

FarmLogs offers various tools for managing and monitoring agricultural production, including monitoring crop growth and development, managing inputs and costs, crop planning, monitoring weather conditions, soil monitoring, and crop data collection and analysis. Also offers features like weather alerts, inventory management, updates crop price and yield analysis. The FarmLogs application offers a number of benefits to farmers and farm owners. farms. Farmers can track crop progress through photos, enter notes and receive alerts about potential problems. This allows for quick response and timely decision making for better crop cultivation.

In addition, the FarmLogs app allows farmers to plan and manage entries. Farmers can track the quantity and cost of inputs, including fertilizers, pesticides and other resources. This feature helps track and manage production costs and optimize planning and budgeting.

FarmLogs also allows for data collection and analysis. Farmers can collect data on crops, rainfall, temperature, soil moisture and other relevant factors. This data can be used to analyze and make informed decisions about agricultural production management.

The application also provides weather forecasts and weather warnings. Farmers can monitor forecasts and be informed of potential adverse conditions that may affect their production.

FarmLogs is a mobile-friendly application that allows farmers to access data and crop management directly in the field. This is practical for farmers who they have multiple plots or are often on the move.

Also, the FarmLogs application can be integrated with other agricultural tools and devices. such as ground sensors or satellite imagery. This allows for better monitoring and analysis agricultural activities.

The FarmLogs application, although it provides many advantages, also has some disadvantages that must be considered. to consider. One of them is the price, since some advanced features or premium plans may require a subscription or additional charges. In addition, use of the application requires access to technology, such as smartphones or computers with an internet connection, which can pose a challenge for farmers who do not have access to a reliable internet connection on their farms agricultural areas.

Also, the compatibility of the FarmLogs application may be limited due to operational requirements. systems or devices that users own, which may affect functionality and access application. Dependence on the accuracy of entered data can also be a disadvantage, because imprecise or incomplete data can lead to incorrect information and recommendations.

Furthermore, the FarmLogs application can be targeted to specific regions or types of agriculture, which means that some functionalities may not be suitable for all users. These disadvantages should be taken into account before making a decision to use the FarmLogs application, and users should conduct additional research to better understand these aspects of the application and assess their relevance to their own agricultural needs.

FarmLogs is most commonly used in the United States. This application is popular among farmers in the US, especially those who grow crops such as corn, soybeans, wheat, barley and other crops often grown on American farms.

Although FarmLogs is most commonly used in the US, the application is also available in other countries. farmers around the world, including Europe and other parts of the world. However, it is important It is worth noting that the functionality and fea-

tures of the application may vary depending on the region and type agriculture. Therefore, farmers outside the US may need additional verification to determine how well the FarmLogs application is tailored to their specific needs and conditions.

FarmLogs is available in Croatia via the internet and can be used via a web browser on a computer or via a mobile application available for iOS and Android devices. The application is available in a basic free version, as well as a paid version that offers more advanced features [8].

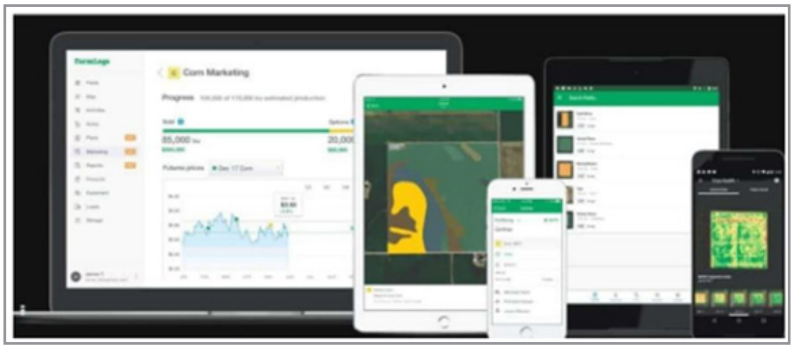

Figure 4: FarmLogs application

Method of Use, Testing and Analysis of Work

The following chapter will explain how to use the application, show how the application works on some examples and at the very end an analysis of the application itself.

Method of Use

To test the application, we will demonstrate its operation on its main functionalities, user login, adding a new activity and displaying a list of previous activities. After the user launches the application, the screen shows the login or registration activity user. If the user is not an existing user, below the login button there is button for registering new users. If the user has successfully logged in, the screen will be displayed with all previous activities. If the current user is a new user, he is shown blank list and offers him the possibility of creating a new agricultural activity. By clicking on the button, A new activity opens a screen that allows the user to enter all the necessary parameters for successful monitoring of the work of their farm. To create a new activity, the user needs to fill in required input fields to be able to better describe each activity [11].

After entering the individual parameters necessary for carrying out a particular agricultural activity. The user has the option to save the new activity. By clicking the Save button, the user returns to to a screen that shows him a list of his previous activities where he can also see his newly created activity. Returning to the activity list screen shows the user a list of their previous activities, but at the same time gives him the ability to create a new activity by clicking on the New Activity button.

Demonstration of the Application's Operation Using Examples
Testing the application will verify the correctness of its functionalities, adding new ones users, saving new user activities and displaying previous activities within the list. We start testing by creating or registering a new user, after which we are given successful registration opens a screen with an empty list. If the user is successfully registered we can see his successful registration on the server, while in the application itself he is opens a screen with a list of activities. Along with a welcome message with the user's username. The current user's list is empty because they have not added any agricultural products yet activity. Below the list view, we are offered a New Activity button. By clicking on the New button activity, a new screen NewActivity opens to the user. Within this screen are fields that the user needs to fill in to create a new activity. If the user has filled in required fields, the new agricultural activity can be saved by clicking the Save button Clicking the Save button saves the new activity to the database, opens a screen with a list of previous activities saves and displays the new activity in the list and notifies the user that the new activity is activity created. Once the list is created, the user can create a new list by clicking the button New activity [9].

Application Performance Analysis

Testing the application determined that it performs all of its intended functionalities. After successfully launching the application, the user is presented with a screen for entering their username and password. If the user has entered the requested data correctly, clicking the Log in button displays A new screen will appear displaying your previous activities along with a welcome message. Successful by filling in the required fields, the user saves the new activity by clicking the Save button after which displays a message about the successful creation of a new activity. Then the newly created activity is displayed to the user at the bottom of the list of previous activities. Since the application they do not show any errors, the application's goal has been achieved, but there is still room for upgrading the application so that it can make it easier for farmers to manage and care for both with their crops as well as their activities [11].

Conclusion

The growth of the world population requires improved production to ensure food security in all areas, especially in agriculture. However, there are cases where demand and supply are not balanced. Improving agricultural production still faces significant challenges in managing and retaining staff and capital.

The top choice for increasing food production, resource management and work is smart agriculture. The growth of the world population requires improved production in order to provided food in all areas, especially in agriculture. However, in certain at times, supply and demand will not equal supply.

Improving agricultural production still faces significant challenges in management and retention of staff and capital. A superior strategy for boosting food production, resource and labor management is smart agriculture. IoT-based agricultural system

helps the farmer to monitor various parameters in his field such as moisture, soil temperature and humidity using specific sensors.

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