# ESTIMATION APPLICATION OF CHLOROPHYLL CONTENT IN ORANGE PLANTS FOR FERTILIZER RECOMMENDATIONS USING CLARIFAI API TECHNOLOGY ON ANDROID SMARTPHONE

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## ABSTRACT

In line with the development of the mindset of farmers in maximizing agricultural productivity by utilizing technological progress and information and applying it in the field. To produce good citrus fruits, one of them is the care of farmers who often give fertilizer. But problems were found in terms of fertilization. Fertilization that is happening there still uses a manual system by matching the leaf color chart that has been provided. It is very difficult to determine or match the color of the leaves because some of the farmers there are old and color blind. Application development to solve this problem waterfall software method. Make a mobile application that can help farmers deal with these problems. And the results will be outlined in the Application Development Estimation of Chlorophyll Content in Orange Plants Utilizing Clarifai API Technology on Android Smartphones, and this application will utilize the Camera feature on the user's android device as a feature of taking pictures or samples of the leaf. By using the beta testing method where the application user is given a questionnaire question addressed to 5 respondents, it is concluded that 3 out of 5 respondents strongly agree with the appearance of the application, 4 of 5 answered strongly agree that this application is helpful in the activity and 2 of 5 respondents strongly agree with the ease of operating the application.

**Kata kunci :** Klorofil, *Smartphone Android*, Tanaman Jeruk, *Api Clarifai*

## 1. PRELIMINARY

In line with the development of farmers into thinking patterns to maximize agricultural productivity by leveraging advances in technology and information and apply it in the field. To produce citrus fruits is a good one from the care farmers often give fertilizer. The fertilization in do farmers currently match the right way with the color of the leaves of leaf color chart.

The crux of the problem there, that is still a lot of farmers who have already stepped on the age old so his vision is also not so normal and there are also color blind, it is very difficult to distinguish or determine the color of the leaves with the already described. leaf color chart.

So as a way to ease the farmers ' in terms of fertilization with enough way that will use the application, it is not difficult for farmers simply directs the camera android smartphone to the leaves then take photos of leaves, the application will send the photo leaves to the server then the server will be analyzed the leaf color. The results of the analysis are also features of text into sound so that when there are farmers who ... its not normal enough to listen to the results of the analysis. The analysis process utilize technology API Clarifai as picture-processing tool. Based on problems that have been described, then this study intends to offer a solution that is to build a system that can make it easier for farmers in determining the color of the leaves and recommend the appropriate amount of fertilizer. As for the system to be built in order to facilitate access to its use, based on mobile devices with the Android operating system.

The purpose of this research is to build applications estimated content of chlorophyll in plants of citrus for fertilizing recommendations utilizing the technology of API Clarifai on android smartphones.

a. The goal will be achieved is to make it easier for farmers to know the levels of chlorophyll and the color of the leaves of a plant..

b. To facilitate farmers to determine types and measure the appropriate fertilizer at a citrus plant.

## 2. THEORETICAL BASIS
### 2.1 Understanding Orange Plant

Orange is a fruit that has important economic and health value meaning because it contains a very high nutritional value of vitamin A and vitamin c. Citrus fruit can be consumed directly as fresh fruit or juice and can also be processed into syrup.

Orange average productivity in Indonesia is still low, anyway there is an indication that after 7-year-old citrus productivity tends to decrease. The decline of productivity is suspected due to water shortage, disruption, rooting due to soil conditions, pests, and diseases, and others. [1]

## 2.2 Application

Application software, namely software used to help computer users to carry out his job. If you want to develop your own applications, then to write such an application, it is a programming language that can be shaped as assembler, compiler or interpreter. [2]

## 2.3 Android

Android is a opresai system in use in smartphones and tablet PCS also functions the same as Nokia's Symbian and iOS in Apple. Android was first developed by a company called Android Inc., and in 2005 in the acquisition by internet giant Google. Android made with base Linux kernel that has been modified, and its release in the give the code name based on the name of the dish of food. [3]

## 2.4 MySQL

MySQL is the implementation of a system of managed relational database that is distributed for free under the GPL licenses. Any user can freely use MySQL, and its use is not for commercial interests. MySQL is a derivative of one of the main concepts in the database who have been there before; SQL (Structure Query Language), is a central concept in data base, especially for election or selection and data entry, which allows to use the data in easily working on automatically. [4]

## 2.5 Web Service

Web service containing application logic is a set of objects and methods that are located inside the web server connected to the internet so that it can be accessed using the HTTP protocol and SOAP (Simple Object Access Protocol). Web services can also be used to complete a new application that wants to memriksa financial transaction data from a database. The Web Service also facilitates multiple applications for interconnected with other applications of an organization by using a standard that is not bound platform being used. [5]

## 2.6 Analysis Of System Running

The system that is running in the farm there are still farmers manual match the right color of leaves using the leaf color chart so that farmers in the get results sometimes do not fit. In doing matching with leaf color chart is very difficult due to the age of farmers already and still there are color blind.

As for the stages of the farmers in the chlorophyll in the leaves compatibility:

1. Match the right color of leaves with leaf color chart.
2. Obtained as a result of matching the color of the leaves of leaf color chart

## 2.6.1 Analysis Method Of Matching The Color Leaves.

Analysis method of color matching this leaves there are several stages:

1. Photographed the last leaves in the send to Clarifai.
2. Clarifai analyze the dominant color of the image.
3. The results of the dominant colors in the color chart with the mismatch leaves, by calculating the value of the similarity of color.
4. Get it in one of the colors in the color chart leaves similar or near-with photos of the leaves.

## 2.6.2 Analysis Of System Architecture

System architecture analysis aims to identify the architecture to be built. Here is the Klorosen application system architecture to be built.

Here is the system architecture Klorosen mobile applications to be built:
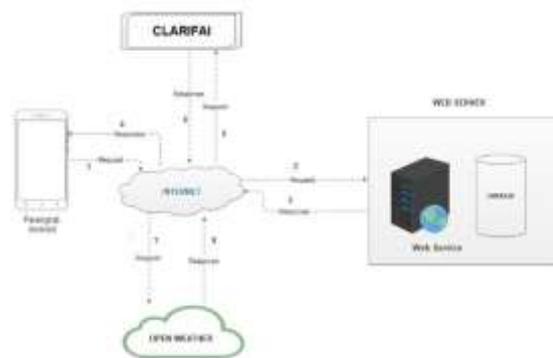


**Gambar 1.** Mobile Platform System Architecture

## 2.7 Non Functional Requirements Analysis

Non functional needs analysis consisted of an analysis of the hardware, software and analysis analysis of the users who will use the application to be built.

### 2.7.1 Hardware Analysis

The system was built to the specifications of the hardware that meets the minimum standard of amenity as follows

The following are the hardware requirements for mobile systems:

**Tabel 1.** The following are the hardware requirements for mobile systems:

| No | Hardware | Minimal Requirements |
|----|----------|----------------------|
| 1 | *Processor* | 800 MHz |
| 2 | Memory | 512 MB |
| 3 | Layar | 3,5 inch |
| 4 | Perangkat Lain | Koneksi Internet |

### 2.7.2 Analysis Software

The system was built to the specifications of the software meet the minimum standard requirements, among others, as follows:

**Tabel 2.** Software Specifications

| No | Software | Specifications |
|----|----------|----------------|

| 1 | IDE (*integrated Development Environment*) | Android Studio |
|---|---|---|
| 2 | Android SDK (*software Development Kit*) | Versi 4.4 (API 19) |
| 3 | JDK (*java Development kit*) | Versi 7 |
| 4 | Sistem Operasi | Windows 10 |
| 5 | Web Browser | Google Chrome, mozila firefox |

### 2.7.3 User Analysis

User analysis is carried out to find out who else is involved in a system. In this application involve one user type i.e. farmers. Here are the characteristics of the users who are in need:

**Tabel 3.** User Analysis

| No | Users | The characteristics of the |
|---|---|---|
| 1 | Users | 1. Understand the use of mobile devices with android. 2. Have the ability in using the internet. |

### 2.8 A Functional Needs Analysis

Describe the process of functional needs analysis activities will be implemented in a system and explain the necessary needs of the system so that the system can run well and in accordance with their needs. A functional needs analysis includes needs analysis, system requirements analysis of data and modeling systems. Modeling systems modelled using UML (Unified Modeling Language). The stages of the analysis natural modeling, among others, Use Case diagram, Class Diagram, Activity Diagram, Sequence Diagram.

### 2.8.1 Use Case Diagram

Use case diagram provides a way of describing an external view of the system and his interactions with the outside world. Here is a use case diagram for the application to be built:
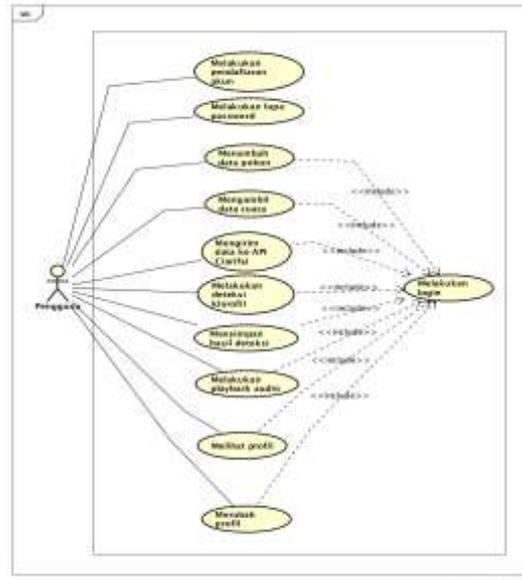


**Gambar 2.** Use Case Diagram

### 2.8.1.1 Use Case Description

On the description use case use case described anything that exists on the use case diagram. The following is a description of an existing use casediagram use case:

**Tabel 4.** Use Case Description

| No | *Use Case* | Deskripsi |
|---|---|---|
| 1 | Melakukan login | Sistem menampilkan form login |
| 2 | Melakukan registrasi | Sistem menampilkan form untuk melakukan registrasi akun pengguna |
| 3 | Melakukan lupa password | Sistem menampilkan form untuk pengguna jika lupa password |
| 4 | Melakukan deteksi warna daun | Sistem menampilkan form untuk melakukan deteksi warna daun |
| 5 | Menyimpan hasil deteksi | Sistem menampilkan menu untuk menyimpan hasil deteksi warna daun dan rekomendasinya |
| 6 | Menambah data pohon | Sistem menampilkan form untuk menambah data pohon |
| 7 | Merubah data pohon | Sistem menampilkan form untuk merubah data pohon yang sudah tersimpan |
| 8 | Menghapus data pohon | Sistem menghapus data pohon yang dipilih pengguna |
| 9 | Menyimpan contoh foto daun | Sistem menampilkan form untuk menyimpan contoh foto daun sehat dan tidak sehat |

### 2.8.2 Diagram Activity

Activity diagram is a diagram to describe the procedural logic, business process and line of work. The following is a description of each activity diagram:
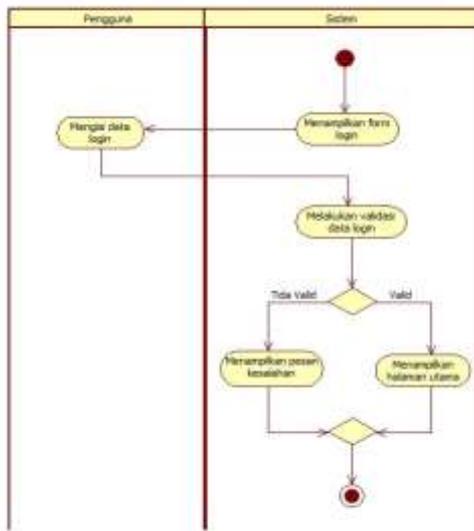


**Gambar 3.** Diagram Activity Login

### 2.8.3 Class Diagram

The Class diagram is a diagram to describe the types of objects in the system and a variety of static relationship existing between them. The following is a diagram of the class for the application to be created:
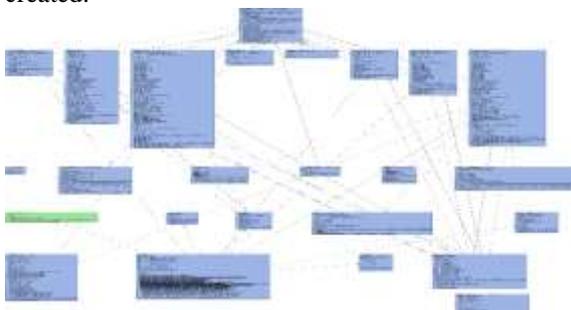


**Gambar 4.** Class Diagram

### 2.8.4 Diagram Squence

Squence diagram diagram specifically lays out a scenario of a single behavior. The diagram shows a number of examples of objects and the messages that pass through these objects in a use case. The following is a diagram of the sequence for the application to be built:
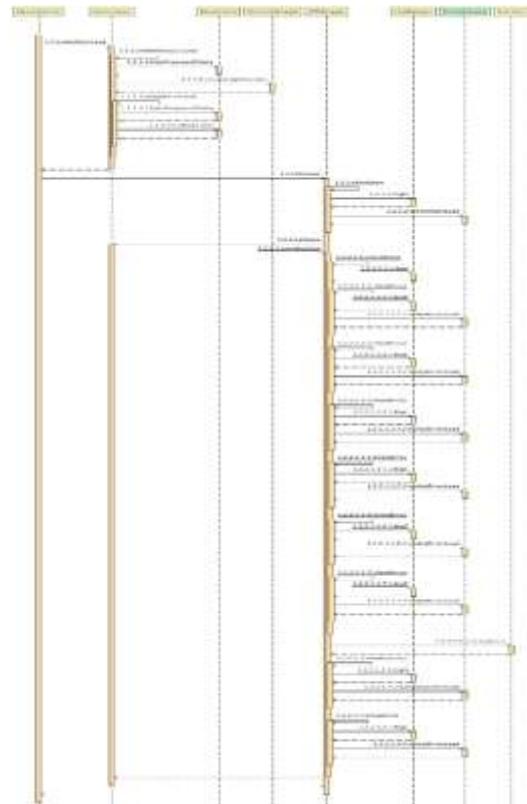


**Gambar 5.** Diagram Squence

### 2.9 Scheme Relation

The partnership scheme is a series of relationships between two or more tables in a database system. Scheme relation of software is as follows:
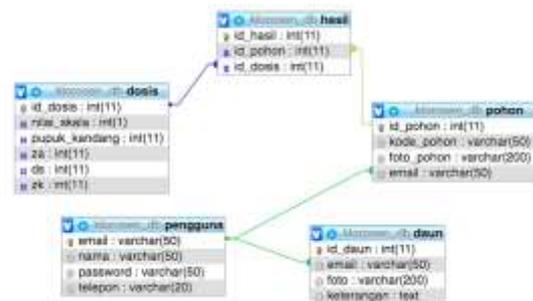


**Gambar 6.** Scheme Relation

### 2.10 System Implementation

System implementation is the stage to apply the design which has been made to the system so it's ready in oprasikan. System implementation include the implementation of hardware, software implementation, implementation, implementation of data interface.

### 2.10.1 The Hardware Implementation

Hardware that implemented on the system that is being built is a hardware device that has a hardware requirements specification. Systems that are built can be seen in the following table:

**Table 5.** Smartphone Hardware Implementation Table

| Hardware | Specifications |
|---|---|
| RAM | 3 GB |
| Prosessor | 4 *core* dengan kecepatan 1609 MHz |
| Memory Internal | 32 GB |
| Sistem Operasi | Android 7.0 Nougat |

**2.10.2 Software Implementation**

The software for the system implementation process includes the operating system and browser. Table of software implementation to run applications are as follows:
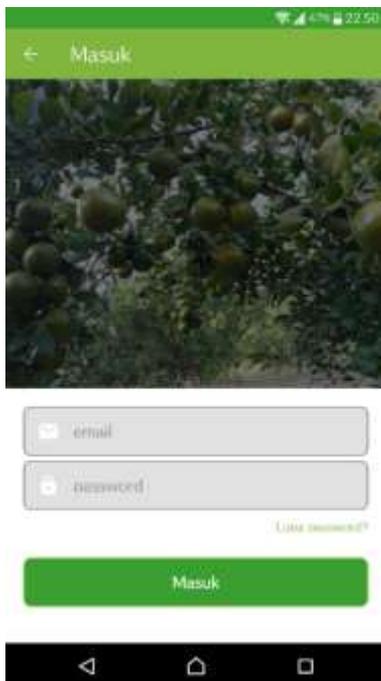
**Tabel 6.** Table Implentasi Software

| Hardware | Specifications |
|---|---|
| Sistem Operasi | Windows 10 64 bit |
| IDE | Android Studio 2.1 |
| Perambah | Google Chrome |
| Text Editor | Sublime Text 3 |

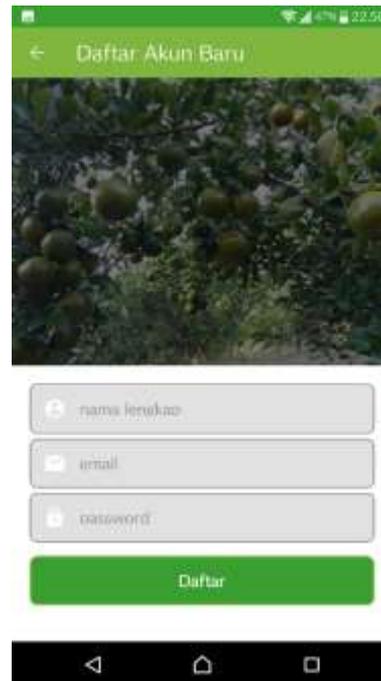**2.10.3 Implementation Of Interface**

Implementation of the interface contains the exposure of any display of the software being built:

1. Login Interface Implementation
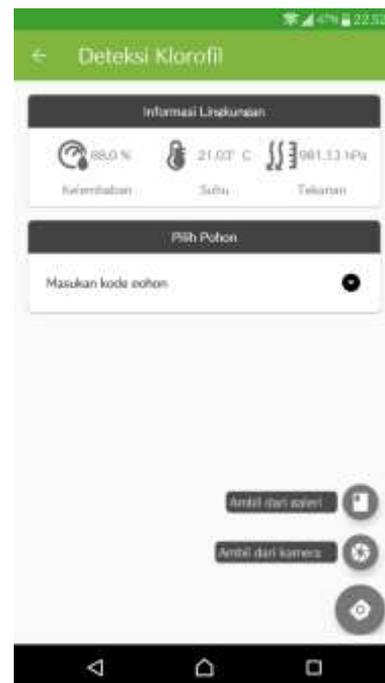


**Gambar 7.** Interface Login

2. Implementation of the list interface



**Gambar 8**. Antarmuka Daftar

3. Detection of the interface implementation



**Gambar 9.** Interface Detection

4. Implementation of the outcome detection interface

**Gambar 10.** Results Of Detection Of The Interface

5. Add a tree interfaccec implementation



**Gambar 11.** Interface Adds The Data Tree

6. Save the image interface Implementation



**Gambar 11.** The Interface Store Photos

### 2.11 Testing The System

Testing the system on the application of estimation of chlorophyll. This stage is the most important thing that aims to find an error or deficiency in the application that is being built.

### 2.11.1 Alpha Testing

Alpha testing is done using black-box method that focuses on the functional requirements of the software. This program testing method using black-box. Black-box testing is testing a program based on functional view of the program. The purpose of the black-box method is to find the error function in the program.

### 2.11.2 Scenario Testing

Testing conducted by trying all possible happening and testing is done over and over again if in testing errors are found then the search will be performed or repair to repair the errors that occurred. If you've finished doing the repair, it will be done continuously thus obtained the best results. Plan alpha testing will be done on the software this can be seen in the following table:

**Tabel 7.** Table Plan Alpha Testing

| Kelas Uji | Poin Pengujian | Jenis Pengujian |
|---|---|---|
| Login | Input data login | *Black Box* |
| | Validasi data login | *Black Box* |
| Pendaftaran Akun | Input data pengguna | *Black Box* |
| | Validasi data pengguna | *Black Box* |
| | Mengkonfirmasi email | *Black Box* |

| | Menyimpan data pengguna ke database | *Black Box* |
|---|---|---|
| Deteksi | Input data pesanan | *Black Box* |
| | Validasi data pesanan | *Black Box* |
| | Menyimpan data pesanan ke database | *Black Box* |
| Tambah Pohon | Input Data pesanan | *Black Box* |
| | Validasi data pesanan | *Black Box* |
| | Menyimpan data pesanan ke database | *Black Box* |
| Foto Daun | Input Data foto | *Black Box* |
| | Validasi data foto | *Black Box* |
| | Menyimpan data foto ke database | *Black Box* |

**2.11.3 The Test Results**

The test results display the results of a test conducted in accordance with the plan and scenario testing.

1. The results of the testing functionality

**Tabel 8.** Test Results Login

| Kasus dan Hasil Uji (Data Benar) | | | |
|---|---|---|---|
| **Data Masukan** | **Hasil yang diharapkan** | **Penga-matan** | **Kesi-mpul-an** |
| Email: klorosen@email.com Password: klorosen | Login Success Sistem Menampilka-n menu utama sesuai hak aksesnya | Tampil Menu Utama | Diteri-ma |
| **Kasus dan Hasil Uji (Data Salah)** | | | |
| **Data Masukan** | **Hasil yang diharapkan** | **Penga-matan** | **Kesi-mpul-an** |
| Email: klorosen@email.com Password: klorosen | Sistem menampilkan pesan "Email atau password salah". | Tampil pesan "Email atau password salah" | Diteri ma |

2. Beta test result

Testing on the application to the user using a questionnaire given to 5 respondents as a user of the application. Questionnaire for the user application consists of 3 questions and answers using a scale of 1 to 5. As for the scale of the questionnaire and answer the questions that are presented to the user as follows:
Scale Questionnaire Answers
SS : Sangat Setuju

S : Setuju
RG: Ragu - Ragu
TS : Tidak Setuju
STS : Sangat tidak Setuju
The questions posed
These are the questions that are posed to respondents:
1. Apakah anda setuju tampilan antarmuka pada aplikasi rekomendasi pemupukan ini nyaman untuk dilihat?
2. Apakah anda setuju aplikasi rekomendasi pemupukan ini lebih membantu dalam kegiatan atau pekerjaan yang bersangkutan?
3. Apakah anda setuju aplikasi rekomendasi pemupukan ini mudah untuk digunakan dalam pengoperasiannya?

**Tabel 9.** Skor Jawaban Kuesioner

| SkalaJawaban | Keterangan | Skor |
|---|---|---|
| SS | Sangat Setuju | 5 |
| S | Setuju | 4 |
| RG | Ragu - Ragu | 3 |
| TS | Tidak Setuju | 2 |
| STS | Sangat Tidak Setuju | 1 |

**2.12 Black Box Testing Conclusions**
1. Conclusions test results Blackbox
2. Based on the results of the testing that has been done then obtained the conclusion that all of the processes that exist in the application of the recommendation of fertilization has been running as expected. but do not close the possibility that can occur when a program error in the application that is being used, either it was an error on the user's device, the fault of the user himself, or from errors others. Then the process required regular maintenance and inspection or maintenance to ensure that applications continue to run according to what you want.Kesimpulan Hasil Pengujian Beta

Based on the results obtained by the conclusion that beta test:
   a. Farmers strongly agree by looking at the application interface feels comfortable to look at.Petani sangat setuju jika aplikasi rekomendasi pemupukan dapat memberikan atau membantu proses pemupukan menjadi lebih mudah.
   b. Farmers agree with fertilizing recommendations application to use because it is very easy to use.

## 3. CLOSING
**3.1 Conclusion**

Based on the results of testing on the software that was built then retrieved the following conclusions :

1. The existence of this application then processes and the granting of agricultural fertilizer in the garden of oranges easier and better than the previous manual process.
2. An application that is built has been able to provide the information required of the farmers, because it is very helpful in all respects when farmers do in the awarding of the fertilizer.
3. With the features of text into sound very helpful, through the application of farmers who are less able to read text or distinguish the color of the leaves can easily to use his.
4. To operate these applications is also not difficult for farmers, the look that made simple also makes the farmers get more positive benefits from this application..

## 3.2    Suggestion

The application of estimation of chlorophyll for the recommendation of fertilization is also still far from perfection, and it still has drawbacks. Then to it, required the development and further refinement. As for the advice so that these applications can run with more optimal is as follows:

1. The application can perform different types of lime leaves with other types of lime leaves.
2. The application can signal what when there is disruption on citrus trees by using remote sensors and put on certain hardware.
3. The application can detect the disease on the leaves that are less healthy and provide information of his disease..

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