Mapping of Mango Trees in Crisis Land With Web-Based GIS Applications

Moh.Fatkhur Rozi[1], Zulfikar[2*]
[12]Informatics, Universitas KH. A. Wahab Hasbullah
*Email: zulfikardia@gmail,com

ABSTRACT

Mango trees are one of the fruit plants capable of growing in a critical, and often used for conservation. This study aims at mapping mango trees in the northern region of Jombang Regency. In an effort to help the community to get to know mango trees, a web-based mapping system is created using JS, XAMPP, and PHPMySQL software. This research was conducted with several stages in the system of systems, namely secondary and primary data collection which will be used for the system database. The results of this study have been designed a web-based mango plant mapping application that will provide information for the community and related agencies in finding data and mango fruit.The results of a poll of 30 respondents showed that 92% were enthusiastic about using this application so that the web-GIS application was in demand by the public.

Keywords*: Web-based GIS mapping, mango trees, critical landt.*

INTRODUCTION

Subdistrict Plandaan is an area that has a critical lands in Jombang is an agricultural area located diprovinsi East Java. As an agrarian area, the main livelihood of the population is the agricultural sector. Analysis of agricultural land is needed, because with knowledge of agricultural land can be predicted to harvest, and recommendations for appropriate land use, so that in the end getting maximum yield for the community. The potential of existing food source diversity needs to be made applications that can carry out land mapping to encourage the appeal of consumers or processed producers of agricultural products(Ministry of Agriculture, 2019).

One of the dominating plants in the district of Placeaan is Mango. Mango plants are the most cultivated plants, both personally and for commercial purposes because of the economic value of the fruit The productivity of mangoes growing on critical land in Plandaan District, Jombang Regency is able to reach 85.00 (kg/tree) with a harvested area (trees) of 21,750, thus becoming one of the largest mango productions in Jombang district (BPS, Jombang, 2015). Mango plants are not from Indonesia, but from South Asia.Mango fruit can be consumed directly when cooked or raw, and can be processed into food and drink. The obstacle that is often experienced by the community is the limited geographical information regarding the existence of mango trees (Hariono & Ashoumi, 2020). Applications that are often used to deliver the location of plants are GIS, because this application makes it easier for someone to get to know the faster position of the growing place (Tamam et al. 2019); (Sufaidah et al, 2020).

GIS information as a means that are widely used is not only limited to mapping mango plants, researchers have often been used for other plants, such as rice plants (Soelistio et al. 2015). Information provided by GIS devices, is accurately able to accelerate the information submitted so that the use of GIS as a tool to map plant vegetation is very appropriate (Suryanto et al. 2017); (Widya & Airlangga, 2020).

Based on the above background, a mapping mapping application of mango plants on critical land with web-based GIS applications as information media to the agriculture and community services in need. The mango tree as a commune to consumption and for the purposes of food or processed foods from mango, so the results of this Web-GIS design can help the community in providing information on mango plants in the Plandaan District easily and precisely.

METHOD

In the process of making this GIS applications, researchers used the Waterfall design method. The stages in this method include Requirements, Design, Implementation, Verification, and Maintenance. The stages of the Waterfall method can be seen in Figure 1.
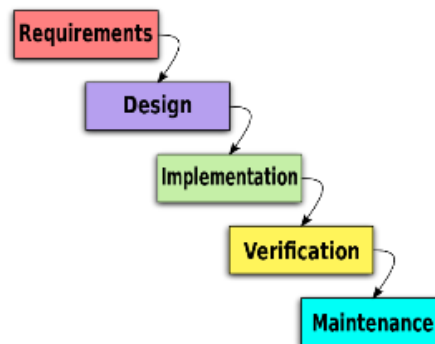

Figure 1. The Stages of Waterfall Method

The following is an explanation and stages based on the stages in the waterfall method, which is used in designing this GIS application (Sasmito, 2017):

- Requirements

    This stage needs to be done because it is the first stage in the waterfall method. In this stage discuss and analyze the needs needed in the game and determine the data, materials and others needed in making the GIS applications.

- Design

    This stage is the second stage in the waterfall method, in this stage the program architecture, style, appearance, or interface player as well as material and material requirements are made. In Figure 2 it can be seen that the flowchart is used to describe a stage in a simple way.
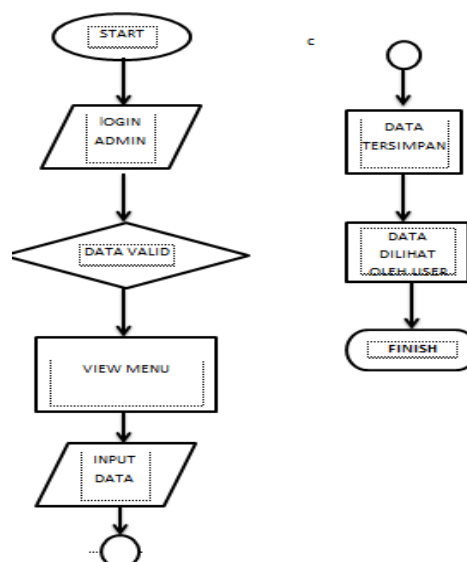

Figure 2. Flowchart

In Figure 2 it can be seen that the flow of making this GIS applications starts from the start, the main menu, the applicatins as a decision to choose, until the end of the GIS.The flowchart illustrates the whole process of making GIS applications (Kurniawan et al. 2020).The following figure is a use case diagram that serves to map and represent user interactions with the system.
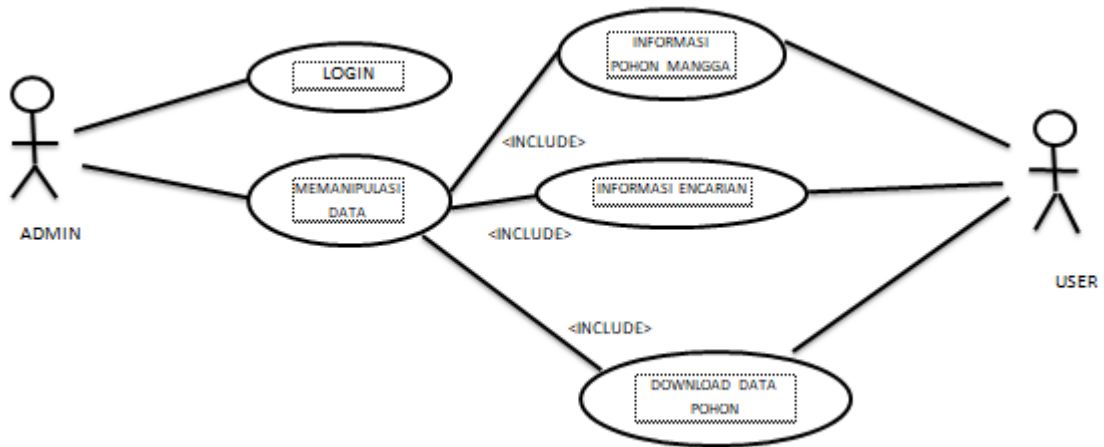
Figure 3. Use Case Diagram

The following image is the activity diagram used for the per menu, activity diagram is useful for explaining the sequence of activity in a process.
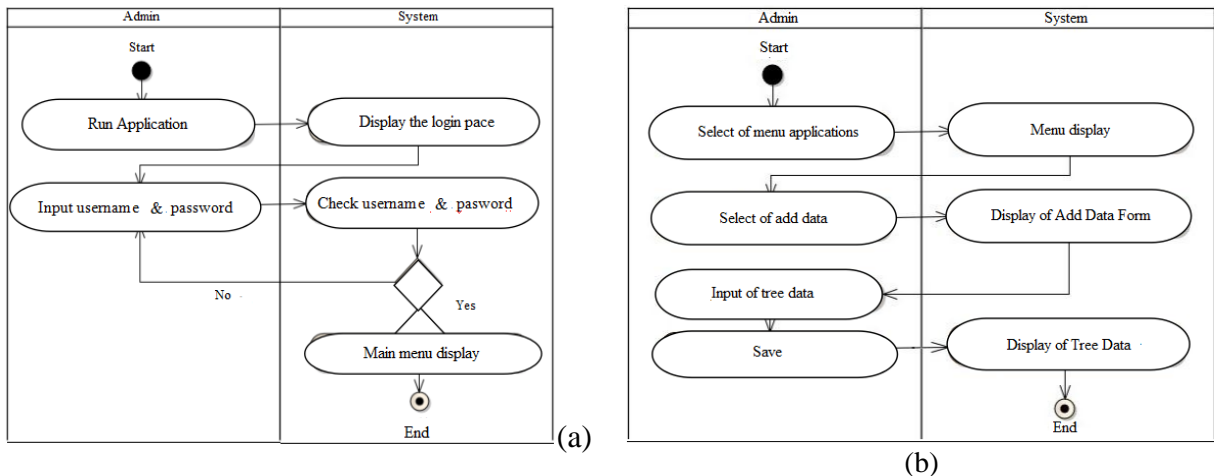

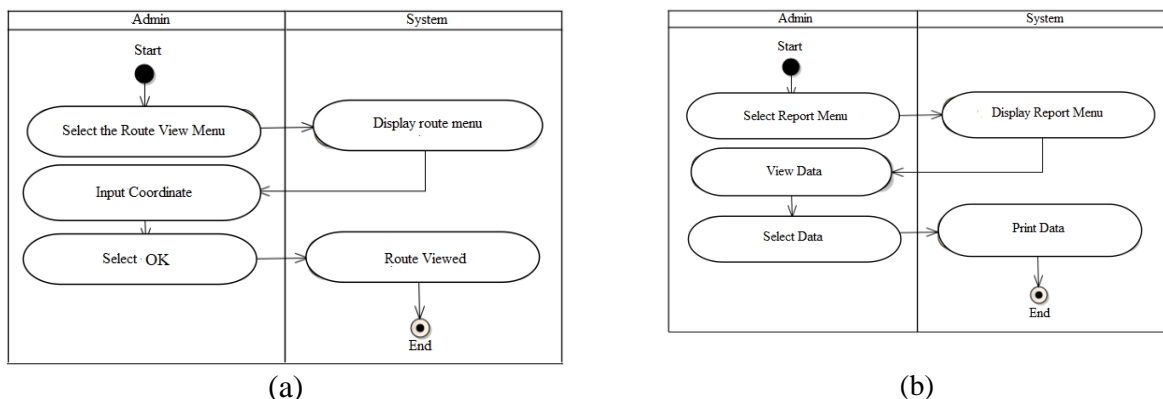**Figure 4.**Activity Diagram Login Admin (a), and Activity Diagram of add Data Admin (b)

Figure 5. Activity Diagram of View Route (a) and Activity of ReportDiagram (b)

- Implementation
  This stage is the third stage, and is the stage of making the menus of the game which will be put together. At this stage testing is also carried out by the developer whether it has met the criteria or not.
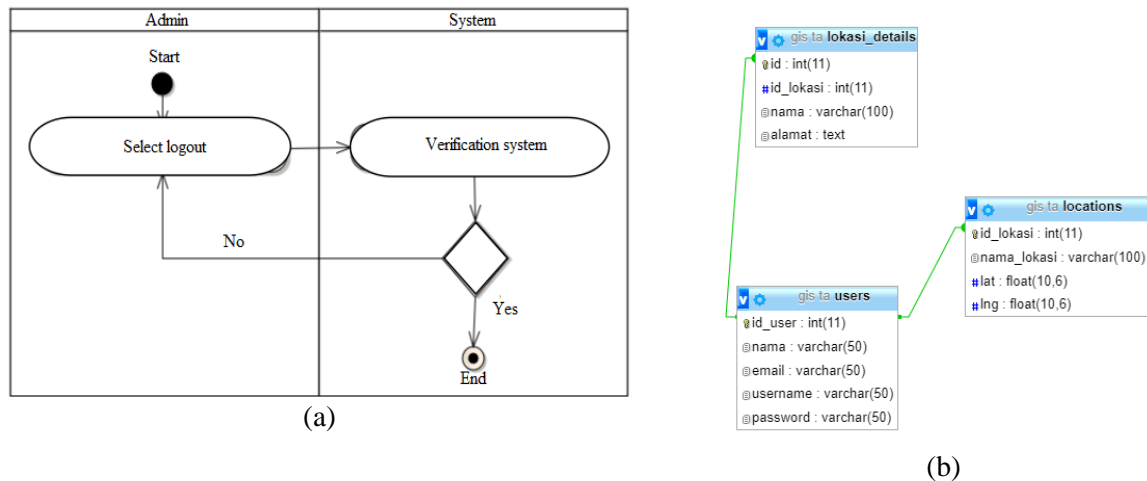
(a)

(b)

Figure 6. Diagram activity of logout admin (a), class dagram (b).

- Verification

    At this stage, the manufacturing process can be said to be complete because at this stage, the game can already be played on an Android Smartphone and it is at this stage that testing is carried out. Tests are performed by users. In this study, the users are children who are kindergarten students and are accompanied by assistants. This stage can be said to be the end of the manufacturing process but not yet over for the development process (Rahman & Triyatno, 2019)..

- Maintenance

    This stage is the last stage of the Waterfall development method. This last stage includes maintenance and care from the installation process to system repair.

RESULT AND DISCUSSION

Result

    In this discussion, the display per menu in the game will be displayed.
• Main Menu of Login Admin

    Main Menu is the initial menu that admin to login before entering the GIS application or other menus as shown in Figure 7 as an image of the main menu.
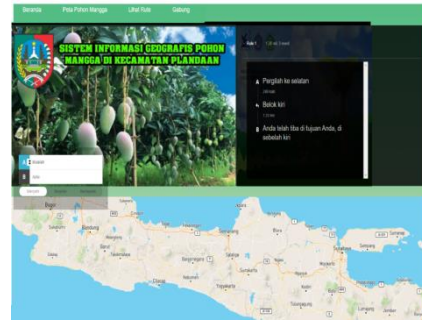

Figure 7. Login menu of admin

• Display Login Admin and View Route

    The Admin menu page contains the veranda features, see the route, as well as mango tree maps, add data etc. for the admin input the data as needed.The view page is a feature where the user wants to go to the desired tree location by entering the coordinates.

(a)

(b)

Figure 8. Page of Admin Menu (a) view route (b)

• Menu of Mango trees

The menu contains visualization of the spread of mango trees according to the coordinates that have been taken, and contain a description of the mango tree.

Figure 9. Menu Select Level

• Admin Register and Report Menu

Menu for admin listings that will operate the application.This page accommodates information about mango trees such as photos, tree names, and complete addresses to make it easier for users to load the required information.

(a)

(b)

Figure 9. Menu of Admin register (a) and Report (b)

• **Display of Main Menu User**

The start page when the user accesses this application and will be directed to other desired menus.

Figure 10. Display of main menu User

• **Web-GIS Testing**

In research and analysis of application system testing using the BlackBox Testing method. In blackbox testing, the testing is based on application details such as the appearance of the application, the functions in the application, and the suitability of the function flow with the process desired by the user. Testing the application this time all the functions that were tested run as expected(Widyagdo et al. 2019).

Discussion

The trial was carried out by community accompanied by researsher or other assistants and asked to fill out the online questionnaire that had been given because the assistants understood more and felt more understanding of the community. In this application test, 30 respondents were used. The companion who fills out the questionnaire is the companion who previously accompanied the person when using this Web-GIS application.

The following is a list of questions that must be filled out by the companion:

• Material Suitability (1-100)
• Understanding Level (1-100)
• Image Fit (1-100)
• Person Enthusiasm in Playing (1-100)

Then the results of the questionnaire were calculated using the average formula per question. The following is the average formula used:

$$\bar{X} = \frac{\sum f}{n}$$

Where:

$\bar{X}$ = means

$\sum f$ = Total of all data

n = number of data

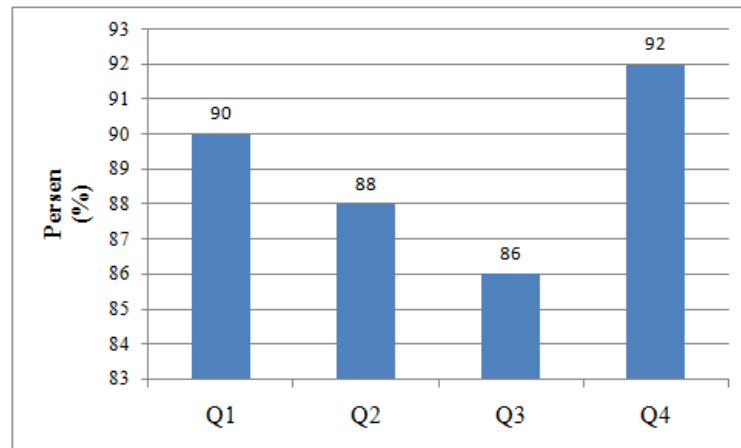The following is a graph of the results of the questionnaire, which can be seen in Figure 6.

Figure 10. Grafic of QuitionaryMean

Based on the results of the opinion poll analysis of the Web-GIS that were made, it showed that 90% stated that this game was in accordance with the material to be taught to community, 88% of this material could be understood by public, 86% stated that the images used were appropriate and finally 92% of community were interested. in this Web-GIS. This shows that this Web-GIS application is very interesting for community in order to increase their knowledge about mango fruit tree.They tend to be more interested and enthusiastic if they applay a Web_GIS, by applying Web-GIS in the form of Mango tree mapping, community have unconsciously introducing by Web-GIS (Susanto et al., 2016).

CONCLUSIONS

Based on the analysis on the application of Mapping mangoes in crisis land with a web-based GIS application, it can be concluded that it is easier for the community or related agencies to find locations and data related to mangoes in the Plandaan sub-district. This application can be accessed on a computer, laptop or smartphone because it is based on a dynamic website. However, its nature which is still localhost cannot be accessed by the wider community because it is not yet hosted on the internet.The test results of the application using the Blackbox Testing method show that there are no obstacles in the process of operating the system flow, menu features and appearance running well as expected.The simple user interface will make it easier for users to access information from the application.The results of a poll of 30 respondents showed that 92% were enthusiastic about using this application so that the web-GIS application was in demand by the public.

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