Web-GIS Application of Agricultural and Food Crop Management

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Abstract

This paper discusses web-based applications in the agricultural and food crops sectors in North Aceh district, Aceh Province, Indonesia. The agricultural and food crops sector is a mainstay sector of the people of North Aceh and local governments to move the economy and income of the local community. There are several superior agricultural products and food crops including rice, corn, sweet potatoes, green beans, long beans, cassava and potatoes. The North Aceh Government does not have sufficient applications to manage agricultural sector products. The research objective is to realize the independence of local food in order to support the national food security program. The mechanism used to design and make agricultural and food crop web applications starts from application design, application construction/coding, application testing and implementation system. After testing the web application by doing black box testing-white box and GUI testing to find out the side of the application display, application behavior and application durability. The results showed the application accuracy, stability and durability of the application reached 97.4%. The application web-based of agriculture and food crop management has been running as it should for mapping/GIS of superior agricultural commodities and GIS potential locations of agriculture and food crops in North Aceh.

Keywords: *Applicaton, GUI, Black Box Testing, GIS*

I. INTRODUCTION

Agriculture and horticulture are highly developed sectors and play an important role in maintaining food security in Indonesia. Indonesia has biological natural resources and is blessed with fertile land, there are various kinds of agricultural crops that can be developed such as rice, corn, sweet potatoes, green beans and others[1]. North Aceh is one of the districts in Aceh Province that prioritizes the agriculture and horticulture sectors as a driver of the regional economy. North Aceh Regency has extensive agricultural areas spread in 27 sub-districts planted with various types of crop commodities. The superior agricultural products of North Aceh Regency include: rice, corn, sweet potatoes, green beans, long beans, cassava and potatoes. In addition there are several potential crops in the agricultural sector to be developed including: areca nut, durian, langsat, rambutan, mango, grapefruit and lime [2]. Local governments have not been optimal in empowering and maximizing the potential of agricultural resources in the area. The North Aceh government does not yet have an application / information system based on GIS to facilitate agricultural development in the region in realizing local food independence in the region [2], [3]. A number of reports have been highlighted in their success in the application of GIS-based information systems / applications that can be used and applied in agriculture [4]–[16]. The purpose of this study is to build web applications and conduct tests on agricultural and food crop applications to assist the North Aceh regional government in mapping agricultural commodities and food crops in the North Aceh region.

II. MATERIALS AND METHODS

The process of developing agricultural management web applications is illustrated in Figure 1. The method used in this research is starting from the design of the application, coding the application and testing the application and implementation of the application. These stages are carried out to identify and verify the right data and information to ensure all data to be published are in accordance with the standards of web-based applications. Then the database / DBMS manufacturing phase is done using the MySQL

database engine. Application coding uses PhP and Java scripst programs. Furthermore, testing the application with black box and white box and testing the GUI to ensure that the farm web application is functioning properly. To get a web-based agricultural application service, it can be accessed from anywhere using a public Internet browser.

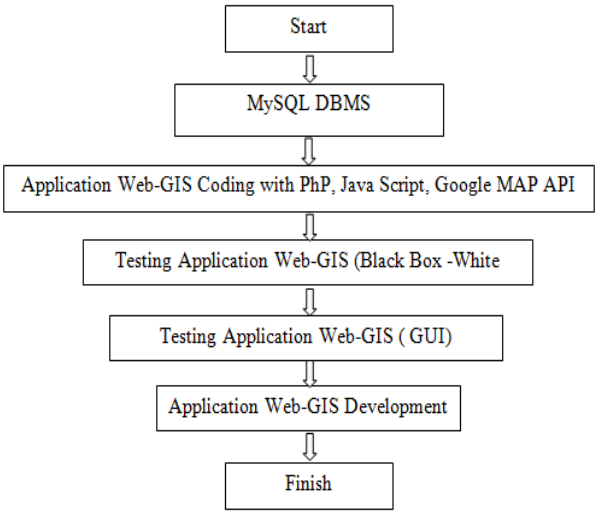

Figure 1. Flowchart of development process of agriculture web GIS application

III. RESULTS AND DISCUSSIONS

The following discussion is like the data flow diagram model (DFD) context diagram on the application, page views and report features on web applications that are built and testing of agricultural web applications with black box-white boxes models and GUI testing.

3.1 Model data flow diagram level 0

Data flow diagram level 0 is the process of data flow entered by the administrator and user (visitor) into the database. The data entered by the admin is stored in different tables, namely: users D1, type D2 from plants, district D3, village D4, commodity crops D5, and potential plants D6. The visitors can then access the agricultural web application to get detailed information about various superior agricultural commodities and the potential for agricultural development in North Aceh Regency by entering keywords. Figure 2 illustrates the process of detailed data flow from agricultural web applications. The results of this system are almost the same as those produced by Lee who made Agricultural e-government in China, Korea, Taiwan and the USA [17]–[24].

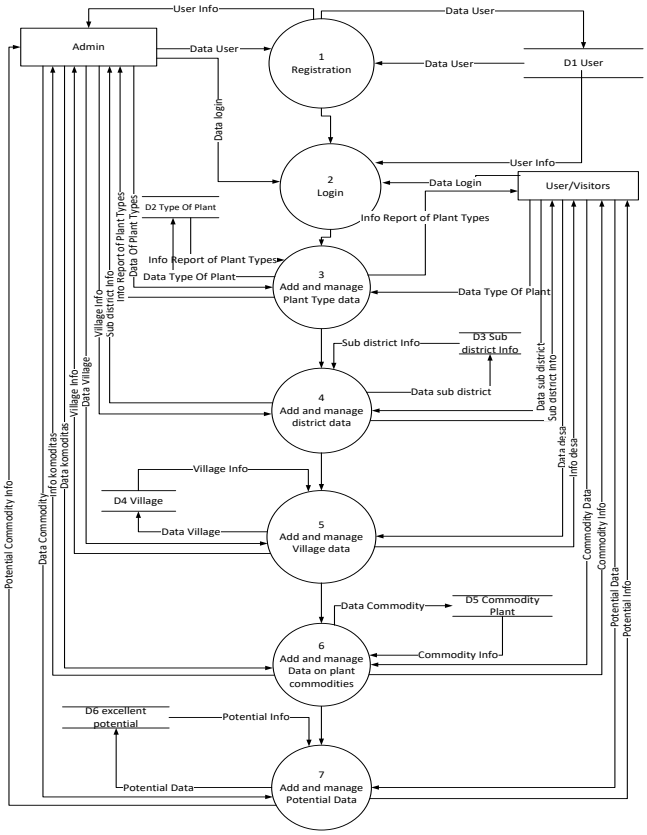

Figure 2. Data flow diagram level 0 application web agricultural management

3.2 Model Data Base Relational

The relational database model of 6 tables, namely : D1 User, D2 Type Of Plant, D3 Sub District, D4 Village, D5 Commodity Plant, D6 Excellent Potential.

After all the stages have been carried out, the agricultural web application GUI model can be explained as follows:

3.3 Page View Web Application

After the admin enters the system, he can choose the menu options contained in the application which consist of the main menu for main data management including sub-district management, village, plant species, commodities, and potential data on commodities that can be developed. On the main page there is also a report (output) that can be displayed by the application as well as a GIS map to see the areas of superior commodity commodities, as well as information menus for agricultural commodities and their locations in North Aceh Regency by entering certain keywords.

There have been additional new report features on agricultural web applications that have been built to facility application [3]. The main page of the system is illustrated in Figure 3.

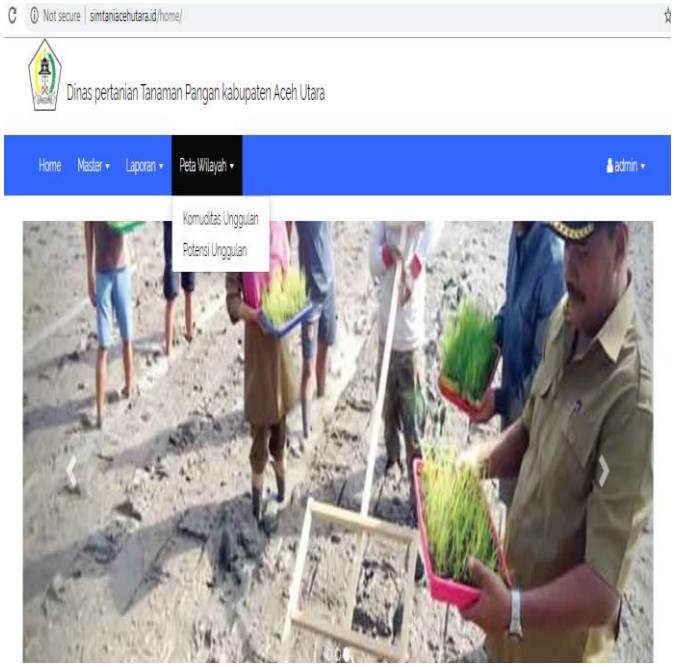

Figure 3. Menu Report feature on the Application

3.4 Map Display

Map view on agricultural applications to find and obtain information about agricultural commodities in North Aceh Regency based on certain sub-districts, illustrated in Figure 4. Users can also find information on the potential of agricultural commodities that can be developed in North Aceh, illustrated in Figure 5.

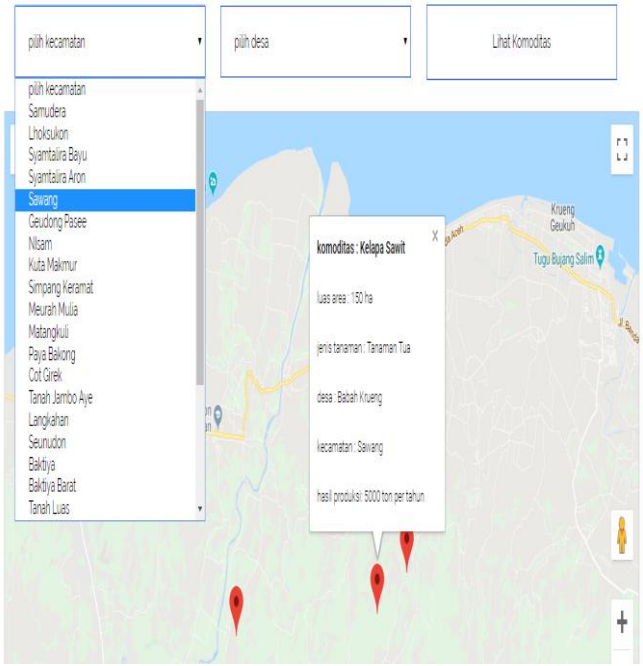

Figure 4. Display GIS results the search for leading of commodity excellent

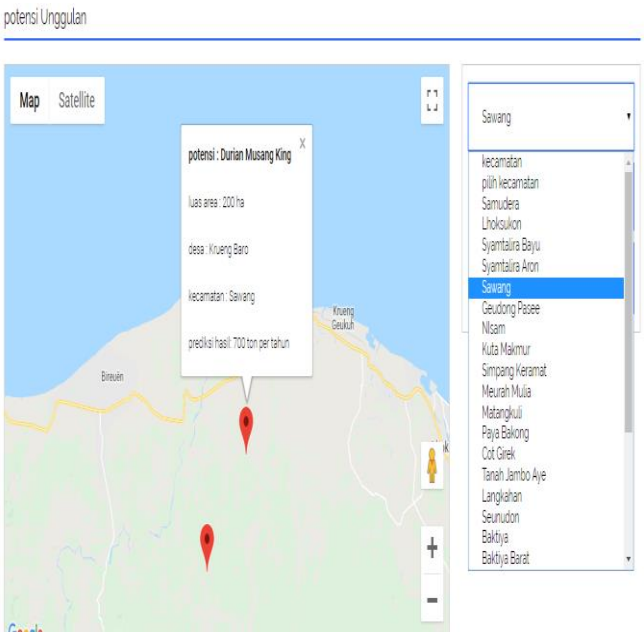

Figure 5. GIS display potential area for the development of certain commodities

3.5 Testing black box- white box models on agricultural web applications

Testing and trials have been conducted on agricultural web applications. Black box testing is used to ensure the functional system is running properly, the application interface has worked well. While the white box test is used to test the logic of the program whether it is appropriate, the use of procedures and if / case functions on the application is running and correct [25]–[30]. Testing black box and white box as illustrated in Figures 6.

Figure 6. Examples of Black Box Testing

3.6 Testing GUI model

There has also been a series of GUI tests on the application to ensure that the menu display on the application is functioning correctly. How graphical modes of data entry work correctly[31]–[36]. The GUI test as illustrated in figure 7.

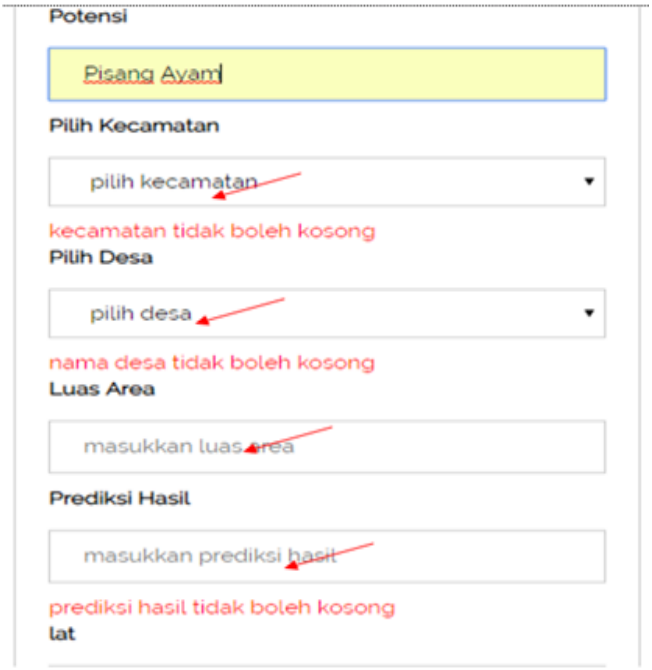

Figure 7. Examples of GUI Testing

Black box-white box testing and a GUI testing are also performed to test the output of the application whether it is appropriate. The superior potential in the sub-district sought in the application is whether it is in accordance with what is produced by the application (examples of potential agricultural commodities sought in the Sawang sub-district and the output produced only for the Sawang sub-district as shown in Figure 5 above). Testing of the application has also been carried out by involving 31 application users / respondents as shown in the graph in figure 8. The test results show the accuracy of the agricultural web application and the floating plants reaching 97.4%.

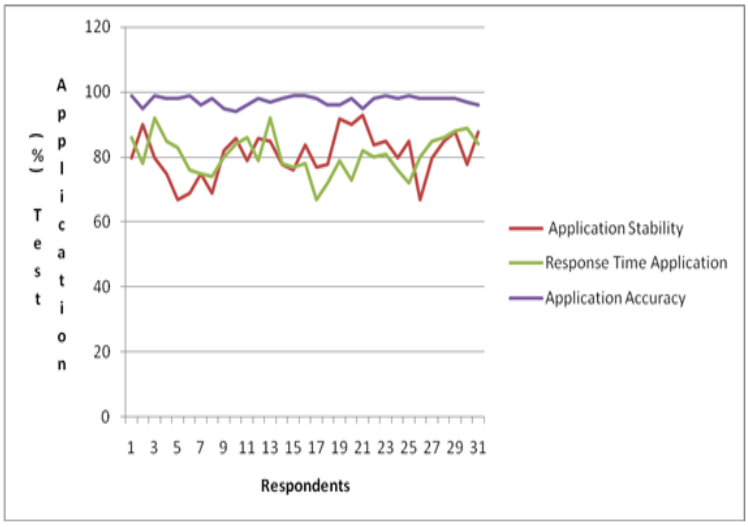

Figure 8. Testing the accuracy of agricultural web applications

IV. CONCLUSIONS

This research has developed a web application for agriculture and food crops management that can help users to obtain information on superior agricultural commodities in North Aceh Regency. Tests have been carried out on agricultural and food crops web applications to ensure the features of the application are functioning properly. The results of application testing involving 31 users (respondents). While the facilities provided on this web application are to find information on the location of commodity producers of agricultural commodities and food crops. The results showed the application accuracy, stability and durability of the application reached 97.4%. The application web-based of agriculture and food crop management has been running as it should for mapping/GIS of superior agricultural commodities and GIS potential locations of agriculture and food crops in North Aceh.

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