Web-based Application of Agricultural Management Development

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Abstract. This paper discusses the web application of the agricultural sector, especially food crops and horticulture which is one sector that drives the wheels of regional economy and the income of the people of North Aceh, Aceh Province, Indonesia. Some agricultural products and food crops that are the leading products in North Aceh Regency are peanuts, long beans, mango, lime, nutmeg and candlenut. The North Aceh regional government does not yet have a web-based application to manage superior products in the agricultural sector. The mechanism used in designing and creating web-based applications starts from designing, application coding and application testing. After testing the web application that has been built with black box and white box testing to determine the behavior and robustness of the agricultural web application. The results showed that the accuracy of agricultural web-based application reaching of 93.4%. The application of web-based agricultural management development has been running as it should for mapping superior agricultural commodities and potential agricultural locations in the North Aceh region.

1. Introduction

Agricultural and horticultural commodities are highly developed sectors and play an important role in maintaining food security in Indonesia. Indonesia has biological natural wealth and is blessed with fertile soil, there are various types of agricultural commodities that can be developed such as rice, corn, beans and soybeans [1]. North Aceh is one of the districts in Aceh Province that prioritizes the agricultural sector, especially food crops and horticulture as a driver of regional economic pillars. North Aceh Regency has a vast agricultural area spread across 27 districts planted with various types of plant commodities. The superior agricultural products of North Aceh Regency include: peanuts, long beans, mango, lime, nutmeg and candlenut. In addition, there are several potential crop commodities in the agricultural sector to be developed including: durian, langsat, rambutan, mango, grapefruit and lime [2]. So far, the North Aceh District Government has not been optimal in empowering and maximizing the potential of agricultural resources in the region.

The North Aceh Government does not yet have a GIS-based application to facilitate the development of agriculture in the region in realizing local food independence in the North Aceh region [3-8]. Numerous reports have been highlighted in the successful application of implementation applications GIS (information systems) that can be used and applied in various fields [9-13]. The aim of this study is to build web-based applications and conduct testing of agricultural applications for mapping superior agricultural commodities and mapping locations that have the potential to develop agricultural commodities in the North Aceh region.

2. Literature Review

This literature briefly contains definitions of web applications and GIS.

2.1 Application

Application is a software system in an organization that brings together daily transaction processing needs, supports the operations, managerial and strategic activities of an organization and provides certain external parties with the required reports [14,15].
2.2 GIS (Geographic Information System)
Geographic Information System (Geographic Information System) is a special information system for managing data that has spatial information (spatial references) or computer systems that have the ability to build, store, manage and display geographic reference information, for example data identified by location in a database [16,17]. Geographic information system technology can be used for scientific investigation, resource management, development planning, cartography and route planning [18,19].

3. Research Methods
The development process of agricultural management application for North Aceh Regency is illustrated in Figure 1. The method used in this research is starting from system design, coding application and testing application. These stages are carried out to identify and verify appropriate data and information to ensure all data to be published is in accordance with application data standards. Then the database creation phase is done using the MySQL database engine. Application coding uses the PhP program. Next, test the application with a black box and white box to ensure the agricultural web application is functioning properly. To get web-based agricultural application services can be accessed from anywhere using public Internet browsers.

4. Result and Discuss
The following discussion such as the data flow diagram (DFD) level 0 on the application, the page display and report feature on the web application that is built and the testing of agricultural web applications with black box and white box models.

4.1 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 Jie Wang who made System Based Research and Implementation of Special Agricultural Products Promotion on Android [20,21].
4.2 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 / system users [22]. The main page of the system is illustrated in Figure 3.
4.2.1 Display All Report Commodities

In this report feature the application can display / print to the printer all the superior crop commodities in each district in North Aceh Regency. The report display is illustrated in Figure 4.

| No | Nama Komoditas | Jenis Tanaman | Luas Area | Hasil Produksi | Desa | Kecamatan |
|----|----------------|---------------|-----------|---------------|------|-----------|
| 1  | Jeruk Napit     | Tanaman Tua   | 12 ha     | 23 ton per tahun | Blang Taurakan | Sawang   |
| 2  | Kelapa         | Tanaman Tua   | 500 ha    | 48000 ton per tahun | Rambong Payong | Sawang   |
| 3  | Kelapa Sawit   | Tanaman Tua   | 150 ha    | 5000 ton per tahun | Babai Kruei | Sawang   |
| 4  | Kacang Panjang | Tanaman Muda  | 10 ha     | 150 ton per tahun | Rambong Payong | Sawang   |
| 5  | Pisang Ayam   | Tanaman Muda  | 0 ha      | 0 ton per tahun  | Blang Cut    | Sawang   |

Figure 4. Report All Commodities

4.2.2 Commodity Report Display by District

In this report feature the application can display / print to a printer a superior crop commodity in North Aceh Regency based on the sub-district (search by sub-district can be done). The report display is illustrated as shown in Figure 5.
4.2.3 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 6. Users can also find information on the potential of agricultural commodities that can be developed in North Aceh, illustrated in Figure 7.

**Figure 5.** Reports on Excellent Commodities based on certain districts

| No | Nama Komoditas | Jenis Tanaman | Luas Area | Hasil Produksi | Desa       | Kecamatan |
|----|----------------|---------------|-----------|----------------|------------|-----------|
| 1  | Jeruk Npis     | Tanaman Tua   | 12 ha     | 2 ton per tahun| Belang Teurakan | Sawang    |
| 2  | kelapa         | Tanaman Tua   | 500 ha    | 8000 ton per tahun | Rambong Payong | Sawang    |
| 3  | Kelapa Sawit   | Tanaman Tua   | 150 ha    | 5000 ton per tahun | Babah Kueng  | Sawang    |
| 4  | Kacang Panjang | Tanaman Muda  | 10 ha     | 250 ton per tahun | Rambong Payong | Sawang    |
| 5  | Pisang Ayam    | Tanaman Muda  | 0 ha      | 0 ton per tahun | Blang Cet    | Sawang    |

**Figure 6.** Display GIS results the search for leading of commodity excellent
4.3 Testing black box and 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. Testing black box and white box as illustrated in Figures 8 and 9.
Figure 9. Examples of White Box Testing

Black box testing is also done to test the output on the application whether it is in accordance with the input given. The excellent potential of the sub-districts sought in the application is in accordance with those produced by the application (examples of potential agricultural commodities sought in Sawang sub-district and the output produced is only for Sawang sub-district as shown in Figure 8 above). Application testing has also been carried out by involving 25 users/application / respondent users as shown in Figure 10. The results test of show the accuracy agricultural web applications reaching of 93.4%.

```php
if (isset($_POST['input'])) {
    $id_komoditas = $_POST['id_komoditas'];
    $komoditas = $_POST['Komoditas'];
    $jenis = $_POST['jenis'];
    $area = $_POST['area'];
    $hasil = $_POST['hasil'];
    $kecamatan = $_POST['Kecamatan'];
    $desa = $_POST['desa'];
    $lat = $_POST['lat'];
    $lng = $_POST['lng'];

    if (empty($id_komoditas) || empty($komoditas) || empty($jenis) || empty($area) || empty($hasil) || empty($kecamatan) || empty($desa) || empty($lat) || empty($lng)) {
        if (empty($id_komoditas)) {
            $erid_komoditas = "<font color='red'> id komoditas tidak boleh kosong</font>";
        }
        if (empty($komoditas)) {
            $erkomoditas = "<font color='red'> nama komoditas tidak boleh kosong</font>";
        }
        if (empty($jenis)) {
            $erjenis = "<font color='red'> jenis tanaman harus dipilih</font>";
        }
        if (empty($hasil)) {
            $erhasil = "<font color='red'> hasil produksi tidak boleh kosong</font>";
        }
        if (empty($kecamatan)) {
            $erkecamatan = "<font color='red'> kecamatan harus dipilih</font>";
        }
        if (empty($desa)) {
            $erdesa = "<font color='red'> desa harus dipilih</font>";
        }
        if (empty($lat)) {
            $erlat = "<font color='red'> latitude tidak boleh kosong</font>";
        }
        if (empty($lng)) {
            $erlng = "<font color='red'> longitude tidak boleh kosong</font>";
        }
        $reset = "<a href='Komoditas.php' class='select'>Reset</a>";
    } else {
        $insert = mysqli_query($koneksi, "INSERT INTO komoditastanaman
(id_komoditas,nama_komoditas,id_jenis,luas_area,hasil_produksi,lat,lng,id_kec,id_desa) VALUES
('$id_komoditas','$komoditas','$jenis','$area','$hasil','$lat','$lng','$kecamatan','$desa')");
    }
}``

Figure 10. Testing the accuracy of agricultural web applications
5. Conclusion
This research has developed an agricultural management web application that can help users to obtain information on superior agricultural commodities in North Aceh Regency. Testing has been done on agricultural web applications to ensure the features of the application are functioning properly. The results of application testing involving 25 users (respondents) showed that the accuracy of the application reaching of 93.4%. While the facilities provided in this web application are to find information on the production location of superior agricultural commodities in North Aceh Regency and locations that have the potential for agricultural commodity development. Although the agricultural web applications that have been created and tested have disadvantages, namely, the timeliness of application responsiveness is still low, but the data and information provided by the application can be accurately.

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References
[1] Gunawan, Saiful Bahri, Adian, Riswanti 2012 J. Ind. Food and Agr. Eng. 11 18-21.
[2] Department of Agriculture of Food Crops and Livestock of North Aceh, 2012 Agricultural potential in North Aceh.
[3] Kun Wang, Yan F 2017 Int. J. Physics. 887 1-6.
[4] Weishui Yu, Changshou Luo, Yaming Z, Qingfeng W, Chengzhong C 2017 Int. J. Mat. Sci. and Eng. 231 1-6.
[5] Ahmed GB, Rashid A, Balasundram SK, Abdullah AF 2016 Int. Conf. Env. Sci. 012044 1-8.
[6] Fucheng Wan, Ning Ma, Dongwei Y, Zhangyuan X 2017 Int. Conf. Ser. Mat. Sci. and Eng. 231 1-8.
[7] S Y J Prasetyo, Y H Agus, C Dewi, B H Simanjuntak, K D Hartomo 2017 Int. J. Sci. and Eng. 180 2-9.
[8] Nizamuddin, Hizir, Ardiansyah, D Pertawi, Handayani P 2016 Int. J. Ear. and Env. Sci. 56 1755-1315.
[9] M R Fachrizal and F Ramadhan 2018 Int. IOP. Conf.Inc.407 1-5.
[10] Amiruddin 2016 Int.Conf. Ear and Env.Sci. 37 1-8.
[11] Gharehbaghi and Christina 2017 Int.Conf. Ear and Env.Sci. 127 1-6.
[12] D S Soegoto and D A Oktady 2018 Int. IOP. Conf.Inc.407 1-7.
[13] Chao Zhou 2017 Int.Conf. Ear and Env.Sci. 64 1-8.
[14] Joo J, Hovav A 2016 Int. J. Tech. Inf. 22 94-116.
[15] A Y Iskakov, R V Meshcheryakov 2016 Int. J. Inf. Tech. 52 7-11.
[16] Li G, Zhou K, Wang J, Sun L, Wang Q, Qin Y 2010 Int. Conf. ICISE.41 56-60.
[17] A A Kadir, M Kaamin, N S Azizan 2015 Int. Conf. Eng. 67 4-10.
[18] N Yasmin, Ismail A, Rosfazreen 2016 Int. Conf. ISAI. 1069 1-9.
[19] Wu Huanqin, Jin Yasheng, Dai Yugang 2017 IOP. Int. Conf. Ear. and Env. Sci. 69 1-7.
[20] Salahuddin, Husaini and Anwar, 2017 Int. IOP Conf. Series 953 1-10.