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Geographic Information System for Mapping Vegetable Producing Areas in West Bandung Regency complete with maps and travel routes

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Abstract

This study develops a system that provides information about the location of producing vegetables and fruit and the route to the selected location in the form of a map in the form of a GIS system. This research was conducted to support the Department of Agriculture and Food Security of West Bandung Regency (KBB), which does not yet have such a system. Information about agriculture and food crops is still in the form of news and simple and there is no map feature, let alone a route feature to the location of producing vegetables and fruit. Making this web using the PHP programming language, MySQL database, CSS, HTML, Google Maps API. Information on vegetable and fruit producers was obtained from the Department of Agriculture and Food Security of the KBB. The map was taken from Google Maps, then edited to provide information on producing vegetables and fruit and travel routes to the selected location. The results of this study are a Geographic Information System which is displayed in the form of a website equipped with features in the form of information on the location of vegetables and fruit producers, news, articles, visitor comments, maps and routes to vegetables and fruit producers. These maps and routes have been adapted to the actual conditions to be passed by web visitors or fruit and vegetable commodity seekers in West Bandung district. The location of this object was obtained by conducting a direct survey to the object of agriculture and vegetable and fruit producing plantations. By implementing features from the Google Maps API that utilize the Auto Update function and Directions Service to display maps in mapping the location of agricultural commodities for this geographic information system, visitors can find out the locations of agricultural commodities in West Bandung district without having to ask other peoples. Website administrators can add new vegetable and fruit producing locations or change or delete. From the results of the questionnaire, it wasfound that the geographic information system for mapping agricultural products in West Bandung district has been running and functioning well with a satisfaction level of 76.92%.

Keywords: GIS, Travel Route, West Bandung, Agriculture, Google Maps API

Introduction

West Bandung Regency is one of the areas with fairly large agricultural land, based on data information taken from the Central Statistics Agency for the area of agriculture in West Bandung Regency in 2021, namely 12,168 hectares of wet land (rice fields and ponds), and 118,409 hectares of land. With this enormous potential, it is hoped that it will attract business actors in the agricultural sector to invest and advance the economy in West Bandung Regency. The size of the agricultural area in West Bandung district with abundant harvests should be balanced with the income earned, but in reality what happens in the field is that many agricultural products are sold cheaply because the scope of sales is relatively small. Currently, farmers market their harvests only through traditional markets through middlemen, so this certainly affects the lack of income earned. Most areas of West Bandung do

not yet have access roads to proper cities, this has resulted in farmers being willing to sell their crops at low prices rather than rotten crops and have no economic selling value anymore. The problem that occurs in the field is that farmers, especially in West Bandung, have difficulty in marketing their harvests so that farmers' incomes are low because they still use traditional methods or through middlemen. In West Bandung, there is also no main market or central market for agricultural commodities that can bridge farmers in selling their agricultural products at auction as in big cities in general. So that the income of farmers in West Bandung is also low because farmers are forced to sell their agricultural commodities in a limited scope. Geographic Information Systems (GIS) have developed rapidly in Indonesia, GIS is made to use information derived from processing a number of data, namely geographic data or data related to the position of objects on the earth's surface. GIS integrates database-based data processing operations that are commonly used today, such as capturing unique visualizations and the various advantages that geographic analysis can offer through its map images. GIS can be presented in the form of desktop applications or web-based applications that can also provide an explanation of an event, forecast events, and other strategic plans and can help analyze general problems such as economic problems, population, social governance, defense and other fields. From the description above, the researcher wants to help overcome the problems faced by farmer groups by designing a system and developing a web-based geographic information system for mapping agricultural areas in West Bandung regency. The main agricultural commodities that are currently still the mainstay are vegetables, avocados, guava and bananas. The developed geographic information system is expected to be able to provide convenience in updating data that can be done by website owners or admins, and able to make it easier for visitors to find the location or agricultural area they want to go to. The position of the website user is determined by the GPS (Global Positioning System) in the user's smartphone. In this case, website users can visit directly to agricultural locations or areas. Thus, the farmers can directly interact with the agricultural business actors. It is hoped that farmers will be able to broaden their horizons about the agricultural business and how to do business in a modern way based on IT (Information Technology).

The list of agricultural coomodities in West Bandung Regency can view at table 1. :

Table 1. List of agricultural commodities in West Bandung Regency

No	Nama	Category	Location
1	Brokoli	Sayuran	Lembang, Saguling
2	Labu	Sayuran	Gununghalu, Saguling
3	Baby Buncis	Sayuran	Sındangkerta, Lembang
4	Ketimun	Sayuran	Saguling, Cipongkor
5	Alpukat	Buah-buahan	Gununghalu, Lembang
6	Jambu	Buah-buahan	Rongga, Sindangkerta
7	Pisang	Buah-buahan	Saguling, Rongga
8	Nangka	Buah-buahan	Parongpong, Cipongkor

Source : Dınas Pertanian dan Ketahanan Pangan Kabupaten Bandung Barat

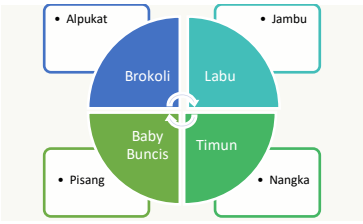

Figure 1. West Bandung Regency Agricultural Commodities

Literature Review

One of the references in this study was carried out by Ari Waluyo and Satria Budi Santoso in 2018 with the research title "Web-Based Tourism Geographic Information System Design at the Department of Youth and Sports and Tourism of Kebumen Regency". The research method used was by making observations at the Department of Youth and Sports and Tourism of Kebumen Regency, then continued with the system development method. The research method used is the SDLC (System Development Life Cycle) method. After the results of the study of geographic information systems, it is hoped that the delivery of tourism information will be more extensive, and tourists can quickly and precisely find information that tourists want to visit. In another study conducted by Bagas Arif Widyagdo, Andri Suprayogi, and Sawitri Subiyanto in 2019 with the research title "Geographic Information System Distribution of Web-Based Agricultural and Livestock Support Facilities (Case Study: Dempet Subdistrict, Demak Regency)". The results of this study are in the form of a website that contains an online map about the distribution of facilities supporting agriculture and animal husbandry in Dempet Subdistrict, Demak Regency which is expected to help people who are engaged, especially in agriculture and animal husbandry. This website was built using the PHP programming language, PostgreSQL as a database, as hosting for the website used VPS. In this website there is information about the Dempet sub-district, especially in the field of agriculture and animal husbandry, and on the map there is a distribution of supporting facilities including, 23 rice mills, 10 shops for agricultural purposes, 9 farms, and 28 floodgates. After doing usability testing, it shows that the effectiveness of the application gets a satisfaction value of 4.42 and efficiency gets a satisfaction value of 4.48. So it can be said that respondents are very satisfied with the performance of the website.

Research Methods

As the first step of this research, the data collection process was carried out at the Department of Agriculture and Food Security, West Bandung Regency. The data obtained is in the form of a list of agricultural locations in West Bandung district, and offline agricultural maps that have been made by the Department of Agriculture and Food Security in the form of brochures for potential investors and seekers of agricultural commodities in West Bandung district. Then data is also collected by conducting direct surveys of travel routes to existing agricultural locations using the help of the direction menu on Google Map and GPS. This is needed so that it can be known whether the travel routes provided by the direction menu on the Google Map and GPS are relevant to the reality of the travel route that must be taken. By implementing features from the Google Maps API that utilize the Auto Update function and Directions Service to display maps in mapping the location of agricultural commodities for this geographic information system, visitors can find out the locations of agricultural commodities in West Bandung district without having to ask other peoples. The Auto Update function feature can always update the position of visitors, so that the location and route of visitors to vegetable or fruit commodities will always be updated.

Results and Discussion

Context diagrams are used to describe and explain the working mechanism of a system in general or in general where context diagrams are the basic concept of developing a system. in the context diagram there are entities that carry out activities to provide data and those who receive data. There are two main entities in this context diagram, namely admin and visitor. The context diagram represents only one process, where covers the entire system in the geographic information system for mapping the agricultural area of West Bandung regency. The Context Diagram on the geographic information system mapping the agricultural area of West Bandung regency.

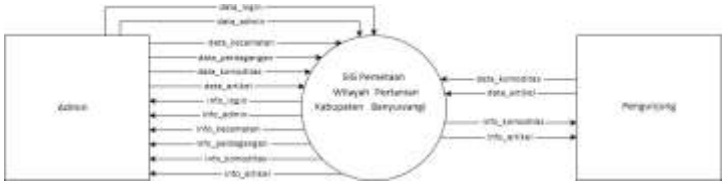

Figure 2. Context Diagram

At level 0 this is an elaboration or solution of the context diagram. At level 0 it is clearer to see the flow of data from entities that provide data and those who receive data from each of the existing processes and through the stages of the process that have been broken down into each part. The Data Flow Diagram Level 0 on the geographic information system mapping the agricultural area of West Bandung regency can be seen at figure 2.

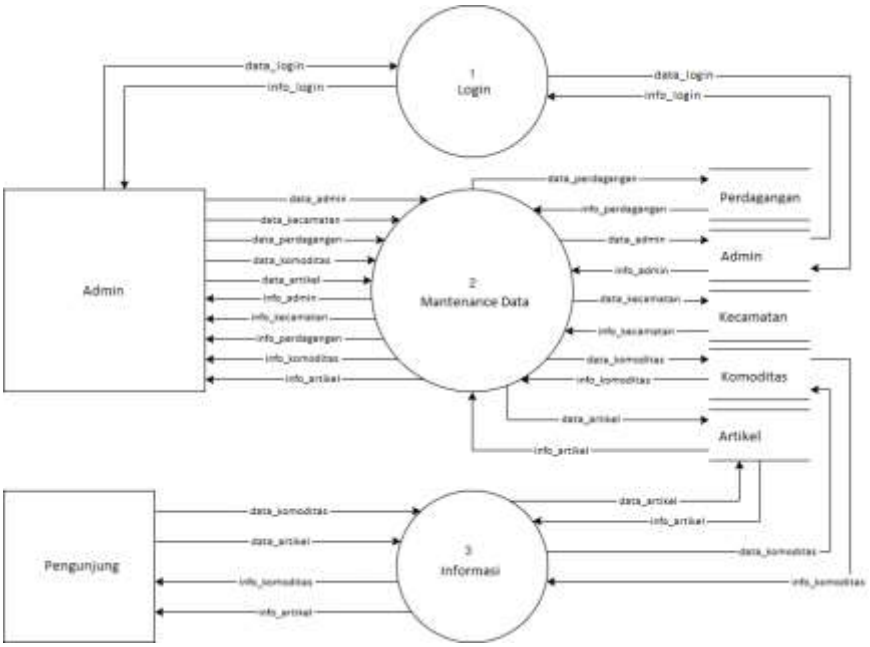

Figure 3. DFD Level 0

Entity Relationship Diagram (ERD) is used to describe the relationship between entities that exist in an information system. The following is an ERD description of the geographic information system mapping the agricultural area of Banyuwangi district which can be seen in Figure 3.

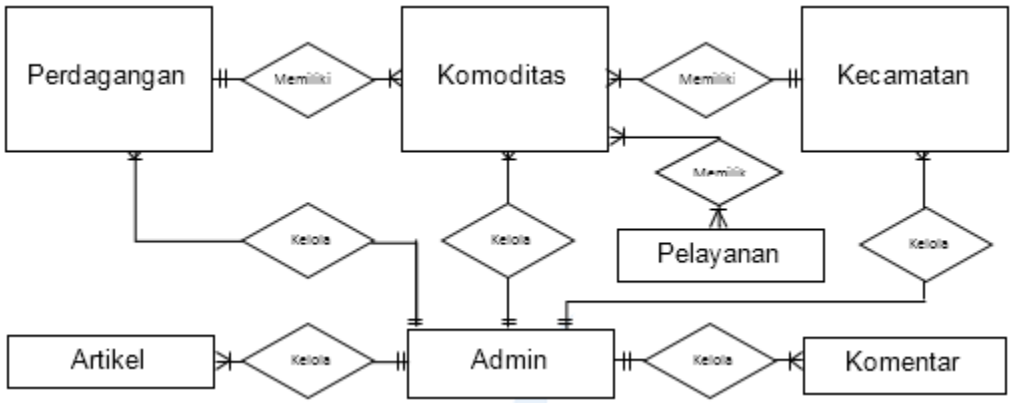

Figure 3. ERD

Implementation

The first home page that appears when the application is opened. This page displays a map of the location of the main commodity, along with the location of the visitor (black standing icon) along with the location points for the main commodity for all types. Figure 4 shown the homepage.

Figure 4. Home Page

If one of the location icons is selected which indicates there is a superior product, a travel route will appear from the visitor's real position to the location, which can be seen as shown in Figure 5.

Figure 5. Featured Commodity location map and route

Figure 7. Description of the location of the commodity.

Conclusions

Based on the descriptions in previous chapters, geographic information systems mapping the location of agricultural commodities in West Bandung Regency, the following conclusions can be drawn:

1. This geographic information system has been designed and built based on a website, where the system design process uses DFD (Data Flow Diagrams), and ERD (Entity Relationship Diagrams), while the system development uses the PHP programming language with the Bootstrap framework.

2. By implementing features from the Google Maps API that utilize the Auto Update function and Directions Service to display maps in mapping the location of agricultural commodities for this geographic information system, visitors can find out the locations of agricultural commodities in West Bandung district without having to ask other peoples.

3. From the results of the questionnaires distributed, it was found that the geographic information system for mapping agricultural products in West Bandung district has been running and functioning well with a satisfaction level of 76.92%.

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