Development of web-based for egg surveillance to maintain egg distribution

R Budiman¹, S P Thoriq¹, M A Suyuthi¹ and L Nurhikmat¹

¹Bogor Agricultural University, Bogor, Indonesia e-mail: rhavif_budiman@apps.ipb.ac.id

Abstract. Recently there was news that the price of eggs increasing, and one of the problems is caused by uneven distribution. A system for particular interest about the data and information for eggs distribution is urgently needed to solve this problem. The objective of this research is to design a system that is able to visualize egg distribution in Bogor through WEB GIS. Development of this information system is Web-based Development Life Cycle (WDLC). This method consists five steps, there are web development planning, engineering web requirements, web application design, web technical implementation, and usage web system. As the result, a prototype design of web GIS has been developed to be able to visualize eggs distribution in Bogor. This system can be used as a tool to determine egg distribution of a location either in Bogor or other location in Indonesia. It is recommended that the government can use this system to support even eggs distribution in Indonesia.

Keywords: egg distribution, web-based development life cycle, web GIS

1. Introduction
Indonesia is a large country with a large number of inhabitant and high population growth rate. Because of that, the demand of food and one of them is egg. Eggs are one type of food that is widely known to have high nutrition and good for human body. Eggs are of particular interest from a functionality point of view, because they offer a moderate calorie source (about 150 kcal/100 g), a protein of excellent quality, great culinary versatility and low economic cost [1]. In Indonesia, recently there was news that the price of eggs increasing, and one of the problems is caused by uneven distribution. A system for particular interest about the data and information for eggs distribution is urgently needed to solve this problem. A system for particular interest about the data and information for eggs distribution is urgently needed to solve this problem.

Geographical Information Systems (GIS) is a system that have ability to integrate geospatial data from many varieties of sources. Obviously, maps play an important role in GIS. Web based GIS is a type of GIS that combines a geographical information system and web technology. The reach of the GIS system multiples manifold when it is implemented through the internet. Not only does it get a greater user set, it also means that the user need not invest in a resource intensive machine to access the Web based GIS system. This makes Web based GIS both cheap and more readily accessible [2]. With different theme or purposes and integrated with spatial data and maps, GIS is a solution to understand spatial data for laymen and experts [3]. While the Web GIS according to ESRI is is a type of distributed information system, comprising at least a server and a client, where the server is a GIS server and the client is a web browser, desktop application, or mobile application. Web GIS offers many advantages including ease of use, support for unified updates, diverse apps and more.
This paper will discuss about WEB GIS that builds display of information about the number of eggs in an area, the price of eggs in an area, and the area in the form of heat maps that are useful to facilitate the public and the government to obtain information about the distribution and number of eggs in an area.

2. Material and Method
The method used in this study is Web-based Development Life Cycle (WDLC) which presents in figure 1. This method consists of five stages, namely web development planning, engineering web requirements, web application design, technical web implementation, and usage web system [4].

2.1. Web Development Planning (WPA)
In web development planning step are to understand the schedule development systems, the strategy are schedule, clearer goal and work plan.

2.2. Web Requirement Engineering (WRE)
In engineering web requirement step, needs data that involve gathering and delivering needs from the user and needs analysis which will result requirements and model specifications. This requirement document needs to be validated for make sure the requirements specified are correct. In this step, involves, search egg distribution problem, and search book, involves eliciting responses and gathering requirements through direct communication, collecting relevant book or any related documents.

2.3. Web Application Design (WAD)
In web application design, all specifications are prepared and developed design needed. The prototype was made to show the feasibility of the design. This stage is done for produce a complete requirement before the construction of the system in fact.

2.4. Web Technical Implementation (WTI)
In web technical implementation step, technical implementation covers the development of information-based systems web, which is the creation of databases, building interfaces, and implementation code so that it can be used in various web browsers. In usage web system, Web-based information systems are distributed well on the web hosting or on the user's own site. Thus, optimization of search engine has been applied.

2.5. Web System Operation (WSO)
In usage web system, Web-based information systems are distributed well on the web hosting or on the user's own site.

3. Result and Discussion
3.1. Web Development Planning (WPA)
Web Development Planning is focus in planning the understanding user needs, characteristics, motivation, website goal and defining the user expectations and requirements of the new or not yet developed website [5]. In this step, WEB GIS developer planning development system. Plan that
developer doing is data processing, needs analysis, design, implementation code program, system testing, and system usage.

3.2. Web Requirement Engineering (WRE)
In this step, there are two main activities. First, requirement elicitation that involve articulating and gathering the client needs. Secondly, requirement analysis which at the end will produce model and specification requirements [6]. In engineering web requirement step, the activities that carried out is collecting system requirements and collecting data.

3.2.1. Data collection and analysis needs. In the initial stages of engineering web requirements is to collect egg consumption data in an area, because to make it easier, the area chosen is the Bogor area, based on [7] Badan Pusat Statistik (BPS) Jawa Barat, in average per capita consumption of egg is 2,199 kg per week in 2017. Because there is no data that mentions the number of eggs that vary in the community, it is assumed that the number of eggs in circulation is the same as the number of eggs consumed by the people of Bogor. Based on [8] BPS 2016, in figure 2, there are names of regions, area, population and estimated number of eggs in Bogor city.

| Sub district  | Area (ha) | Population (person) | Estimated egg (kg) |
|---------------|-----------|---------------------|--------------------|
| Cariu         | 8.555     | 46.186              | 101.563            |
| Cibinong      | 4.611     | 326.519             | 718.015            |
| Dramaga       | 2.632     | 100.679             | 221.393            |
| Kelapa Nunggal| 6.860     | 104.120             | 228.959            |
| Jonggol       | 13.463    | 122.697             | 269.810            |
| Bojong Gede   | 2.824     | 236.486             | 520.032            |

3.2.2. Data collection and analysis needs. This information system has the following functions: (1) displays the map of districts in Indonesia, (2) displays general information about Web GIS egg distribution, (3) displays legends and tables as egg distribution information that supports maps, and (4) data management carried out by the administrator. Map processing systems have the following functions: (1) display maps, tables, legends along with egg distribution data throughout Indonesia, and (2) map navigation includes zoom-in, zoom-out, grab tool and pan on the map.

System functional requirements that describe the entry and exit of data can be seen in figure 2.

| Egg distribution map navigation | Egg distribution data | Egg distribution map view | Egg distribution information |
|---------------------------------|-----------------------|---------------------------|----------------------------|
| administrator                   | system                | user                      |
|                                 | Egg distribution map view | Egg distribution map navigation |
|                                 | Egg distribution information | Search criteria |

Figure 2. Data flow diagram.

3.2.3. Determining User. One of the critical steps is determining user, in determining user determine why user use or visit this website and identify any constraint they will experience during visiting the website [9]. Users of this system are classified into two, the first is general users, namely those
who need information regarding the distribution of eggs in Indonesia. And second is administrator who has access to manage spatial data on egg distribution.

3.2.4. Research tools. The software used in the development of Web GIS and the development of egg distribution systems is ArcGIS 10.3. PostgreSQL 9.2 is used as software for database management, while GeoServer 2.2 Snapshot as a web map server for managing data in the form of maps. Open Street Map is used for map mapping applications, stylers for setting styles (SLD), and XAMPP 7.1 as web servers.

The hardware that will be used in the development of the egg distribution GIS Web is a personal computer with the following specifications: Intel (R) Core (TM) i5-7200U CPU @ 2.50GHz, 8192MB RAM, and 1 TB hard disk.

3.3. Web Application Design (WAD)
Web application design is represented in two ways, namely system interface design, and system architecture design.

3.3.1. Research tools. The design of the Web GIS interface can be seen in figure 3. The main page of the system consists of four main parts, namely:

1. Header, containing system titles, menu buttons, and buttons about the system.
2. The body that contains the map of Indonesia along with the map navigation menu includes zoom-in, zoom-out, grip tool and pan map.
3. Body that contains queries
4. Footer, containing information on the GIS web maker.

Figure 3. Website design.
3.3.2. Raised map button. The purpose of Raised map button is to make it easier for users to distinguish the destination map and other maps.

![Figure 4. Display before click.](image)

![Figure 5. Display after click.](image)

3.3.3. System architecture design. The design of this website architecture was developed using a client-server architecture. The client-server architecture at least has a user interface using bootstrap to build the interface on the client side and distributed data stored on the server side. The client will send the request via the web browser to the web server. The web server then receives requests from users and sends them through a web protocol like HTTP (Hyper Text Transfer Protocol). HTTP will generate the connection between client and server. Map requests sent by users through the web browser will be received by the web server. Furthermore, the web server will forward it to Geoserver which is a geospatial data server, and GeoServer will forward to the data server where the egg distribution database is stored. The website architecture used in system development can be seen in figure 4.
Figure 6. client-server architecture.

3.3.4. Future Implementation. The implementation for the development of web-based for egg surveillance is monitoring and evaluation. The monitoring and evaluation egg surveillance is important tool targeting two elements, that is effectiveness and sustainability. Monitoring and Evaluation should span the life cycle of the system to providing a continuing stream of data and feedback in the ideal situation [10]. This web GIS using monitoring and evaluation system to estimate the amount of the egg in the boundary area. the data that thatget on the monitoring can improve the prospect of sustaining successful outcome at evaluation process. the outcome of this web GIS is based by the transparency and accuracy of estimating the amount of eggs to maintain the distribution of egg at some area.

4. Conclusion
A web-based geographic information system for egg distribution data in Indonesia uses QGIS 2.18.21 which serves to display information names of regions, area, population and estimated number of eggs. This system was built with the Web-based Development Life Cycle (WDLC) research method and implemented on the Windows 10 operating system, ArcGIS 10.3, and PostgreSQL as database management, and integrated with Google Maps and Open Street Map. This GIS allow users to obtain information on names of regions, area, population and estimated number of eggs.

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