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Web-based Buleleng regency agriculture product information system development

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Abstract. Agriculture is very important for the welfare of the nation. However, accurate and up-to-date agriculture data in the Buleleng regency are difficult to find. This study was aimed at making a developmental design of Web-based Buleleng regency agriculture product information system and implementing it to support the region's best products-based regional people economy. The development of this system used the Software Development Life Cycle (SDLC) method with Waterfall model that followed five stages of activities, namely (a) requirements definition, (b) system, and software design, (c) implementation and unit testing, (d) integration and testing, and (e) operation and maintenance. The data needed in the system was obtained by working together with the Buleleng regency agricultural office. Later this system will involve some users with different accessing rights, namely field agriculture extension agents who manage product data, the workers of the agriculture office as administrators of the system, the general public, and consumers who probably come from hotels, restaurants, supermarkets, etc that become the markets of the agriculture products in Buleleng regency. Consumers can order the products. However, this system does not handle online payments. It is expected that with this system Buleleng regency will have accurate and up-to-date data related to agriculture products that are available in Buleleng. In addition, this system can be used as a model for other regencies in Bali and other regions in Indonesia. With the availability of this system in the future, the farmers as producers will get good prices for their products and the consumers will get products of good quality at reasonable prices.

1. Introduction

To survive, human beings need food and drink that contain enough nutrition. Nutritious food comes from plants and animals. These plant products come from plants, the fruits, leaves, tubers, etc. of which are taken for food. Like the staple food of most of Indonesians, such as rice, come from rice plants, the fruits of which are taken. The grain of the rice is then processed to have rice, which is steamed to have steamed rice that is ready to eat.

Agriculture is a human activity of processing natural resources in the form of living creatures to produce materials for food, raw materials for industries, sources of energy to process the living environments. Agriculture aims to produce food materials such as rice, corn, mango, durian, etc. It also produces raw materials such as tobacco, vanilla, cloves, etc, for industries.

Buleleng regency is situated in the northern part of Bali island with an area of 136.588 ha [1]. Its agriculture area is 125.700 ha[2] and its main source of Buleleng regency economy comes from agriculture. It has agricultural land that spreads in nine districts. The food crops from the regency

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include white rice, red rice, coffee, vanilla, vegetables such as carrot, broccoli, cabbage, potato, and fruits such as grape, durian, strawberry, etc.

The government of the Buleleng regency is very enthusiastic about developing agriculture in the region through the Agriculture Office. Various efforts have been made by Agriculture Office to make progress in agriculture, such as by providing counselling to farmers in the villages about pre-production, production, and post-production of farm products. Some progress can already be seen from the availability of food material best products in Buleleng regency. These best products are often exhibited in special occasions such as Independence Day commemoration, the Regency Anniversary commemoration, and other festivities that are related to Buleleng local culture. These activities are done as the realizations of the implementation of Bali governor's regulation No. 99 in 2018 concerning marketing and use of the products of agriculture, fishery, and local industries in Bali, in which shops, supermarkets, and restaurants must buy Bali local products [3].

Buleleng Agriculture Office has very significant problems in doing their duties that need solutions. These include inaccurate or non-up to date agriculture data and post-harvest production processing, especially at the harvest time, the food products are abundant in the harvest crops distribution paths, and the annual fertilizer needs for agricultural activities in Buleleng. The surplus of crops in the harvest time makes the farmers lose since the sale price of their product is very low. This is also the case with unclear distribution paths that cause a loss to the local farmers since Buleleng local products may be bought before the harvest time at a low price, then harvested and brought outside of the region, and are sold again in Buleleng with labels of products that indicate that the products are from outside of Buleleng regency and the products are sold in Buleleng at a high price.

The problems above must be overcome and agriculture has to be planned in Buleleng regency in the future. The Office of Agriculture has done a prior study related to the problems above by working together with the Faculty of Engineering and Vocations of Universitas Pendidikan Ganesha. And the results obtained showed that an information system was needed to record documents of all food materials and best food materials for agricultural products in the Regency of Buleleng. This system will inform relevant users about Buleleng's best products, estimated harvest dates, estimated harvest capacity, and the location of the harvest. In addition, this system also facilitates the farmers to do data updating in relation to products produced, through field agriculture extension agents. The users who are interested in buying the best products can order them, of course after logging in to the system. Based on this planning, then the team of researchers developed a web technology-based Buleleng regency agriculture products information system. This system was a system that pioneered a series of systems that follow which will be designed to solve problems found in Buleleng regency.

Hence, in this study, the problem whose answer was sought was what the design and implementation of the web-based Buleleng regency agriculture products information system looked like.

2. Methods

2.1. Related Studies

The importance of developing this information system is also supported by some studies that belong to the same type. Information technology-based agriculture information and communication system was very important to transmit agriculture information and technology to farmers communities[4]. He also recommended that communications among farmers, coordinators, agriculturalists, and research and community centres should use information technology [4].

Sopuru has studied agriculture in Africa, and written that agriculture in developing countries was still striving to implement agriculture information systems[5]. With designs of some agriculture management information systems, one can predict the weaknesses of agriculture products in Africa, agriculture mismanagement, or the failure of agriculture commodities due to diseases [5]. The same thing is written by Renwick who states that mobile phones and internet penetration into society

facilitates farmers to receive agricultural information[6]. This indicates that information and communication technology products are very useful for transmitting information to rural areas [6].

Oliveira, 2014, developed an agriculture management information system that uses open-source software. The system developmental process was based on the SCRUM method and Evolutionary Prototyping. With this method, clients were involved directly in the development team so that the clients' needs can be understood better by the development team [7]. Prasetyo also developed a management information system to determine the feasibility of harvesting in the agricultural sector. With this system, farmers can find out the feasibility level of their harvest [8].

Sorensen, 2010, in his paper designed a future agriculture information system concept. This model was developed based on Soft Systems Methodology (SSM) and was also based on information obtained from four model agricultural practices that represented various conditions found in all Europe. In its concept model, the entities involved were farmers, government, agriculture researchers, universities, agriculture consultants, meteorology division, agricultural stock managers, and agriculture mechanical technology [9].

Many researchers discuss today's agricultural condition and ideal future agriculture. Thus, Buleleng Agriculture Office wanted to document the existing agriculture products in Buleleng regency so that the information that can be obtained later by the stakeholders can easily be accessed and in accordance with the up-to-date condition. Based on this need, then in this study, a web-based agriculture product information system was designed in Buleleng.

2.2. Development Methods

To solve this study problem, the research team applied a software development life cycle method called the waterfall method. Royce states that this waterfall method is a software development model published for the first time, that came from the military system engineering process [10]. This method applied the steps as seen in Figure 1 below.

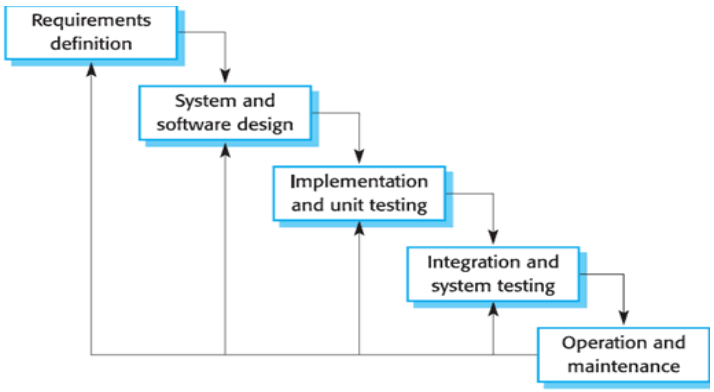

Figure 1. Waterfall Method.

The first step was the requirements definition, in which the research team consult users of the system and produces system service/ function, system definition, and objectives. This result was written in detail and was called system specification.

The second step was system and software design, in which were discussed hardware and software systems. The hardware needed consist of its system architecture, and the software needed consist of software abstraction basic description to be developed.

The third step was implementation and unit testing, in which the software abstraction produced in the previous step was broken into a group of programs or program units Testing was done to find out whether each unit follows the expected specification closely.

The fourth step, integration and system testing, in which program units were integrated and tested as a complete system to meet the software specification that has been determined. If the test is over, the software is given to the customers.

The fifth step, operation, and maintenance. This step took the longest time. The system was installed and used practically. Maintenance might consist of correcting previous errors that have never occurred before, enhancing the function of system units, or adding more services due to the appearance of new needs.

3. Results and Discussion

To overcome the problem in this study, the researchers have followed the steps according to the waterfall method that was described above. Based on the specification of the existing needs some users were involved in this system, that was the general visitor, field agriculture extension agents (FAEA), administrators, and consumers. The general visitor can see general information shown on the web. The users of field extension agents can input, update, and delete data according to the condition met in the field. The data inputted by the field agriculture extension agents consisted of those on farmers, farmers' groups, village, commodities, types of commodities, estimation of harvest dates, and harvest capacities. Administrator users can do some functions such as those of field agriculture extension agents and other functions like managing data on field agriculture extension agents and data on consumers. Consumers were the registered users in the system and was able to order products. More specific information can be seen in the figure 2a-c below.

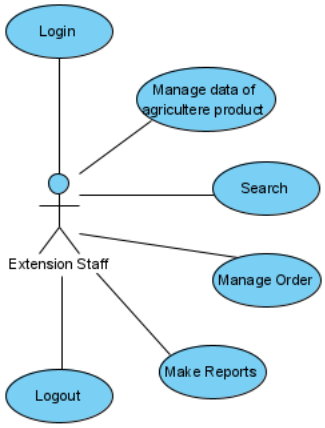

Figure 2a. Use Case Diagram for FAEA.

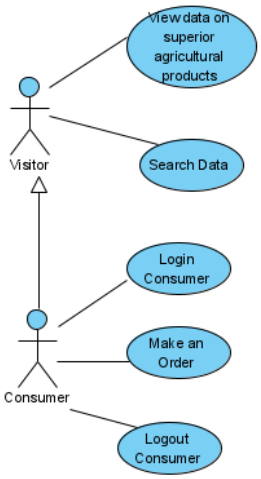

Figure 2b. Use case diagram for actors Visitors and Consumer.

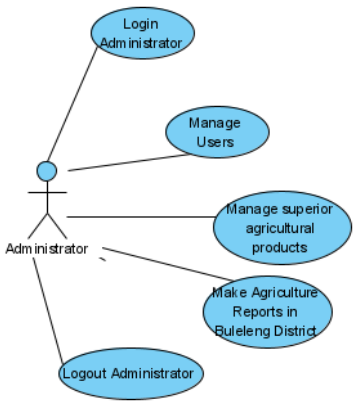

Figure 2c. Use Case diagram for actor Administrator.

After writing the system design, the activity was continued with the writing of the system design, and data basis design. The system data basis involved 18 tables which included user's table, user's categories, farmers group, village, district, regency, commodity, commodity grade, commodity price, purchase. The design of the display was also made and discussed with the system users so that this system can be easily used by the users.

The next step was implementing the design in the form of program units (coding). The program units were tested directly by the research team. If all program units were completed, then the units were later integrated into a full system and tried out again. Table 1 below was some system try-outs that have been carried out.

Table 1. System Try-Outs.

No	Try-Out	Indicators	Results
1	Login	Users can do login according to their Privilege Access (PA). User's Homepage is in accordance with Privilege Access	Login is successful according to PA. Home page has been set according to User. The display can be seen in Figure 3.
2	Adding FAEA data	Administrator can add user's data as FAEA. Administrator can change FAEA data.	Administrator is successful in adding FAEA data. The display can be seen in Figure 4.
3	Looking at product data	Administrator and FAEA can see the list of products according to assisted villages.	Administrator and FAEA are successful to see the products list according to Assisted Village. The display can be seen in Figure 5.
4	Product Search	Administrator and FAEA can search based on names of products, types of commodities, names of sellers, names of farmer groups according to the assisted villages.	Administrator and FAEA are successful in searching for products according to the indicator. The display can be seen in Figure 5.
5	Adding Agriculture Products	Administrator and FAEA can add data on agricultural products, complete with the prediction about the harvests and harvested crops, as well the prices of the crops that the sellers have according to the assisted village farmer groups.	Administrator and FAEA are successful in adding product data based on the indicator. The display can be seen in Figure 6.
6	Looking at data on the sellers	Administrator and FAEA can see data on the sale of each farmers group according to assisted villages.	Administrator and FAEA can see data on the sellers based on indicators. The display can be seen in Figure 7.

After going through the try-out stage, this system was then hosted and could be accessed online at http://siprotani.com. Some program displays can be seen in Figures 3- 7.

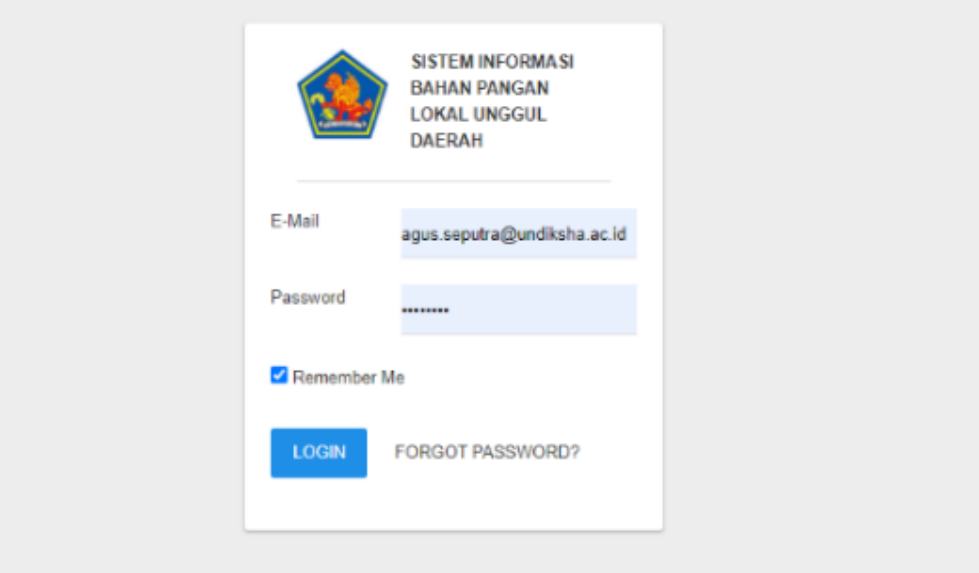

Figure 3. Login Page.

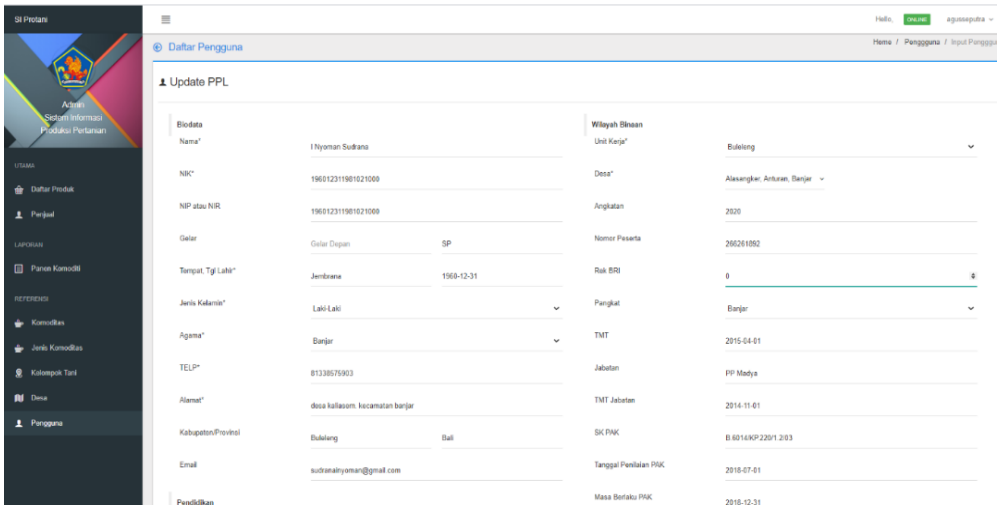

Figure 4. Page to update data of FAEA.

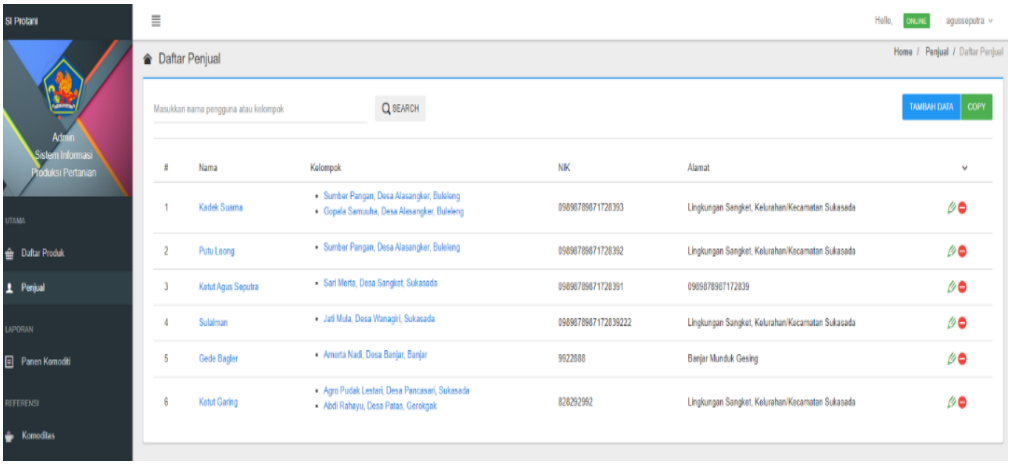

Figure 5. List of Products.

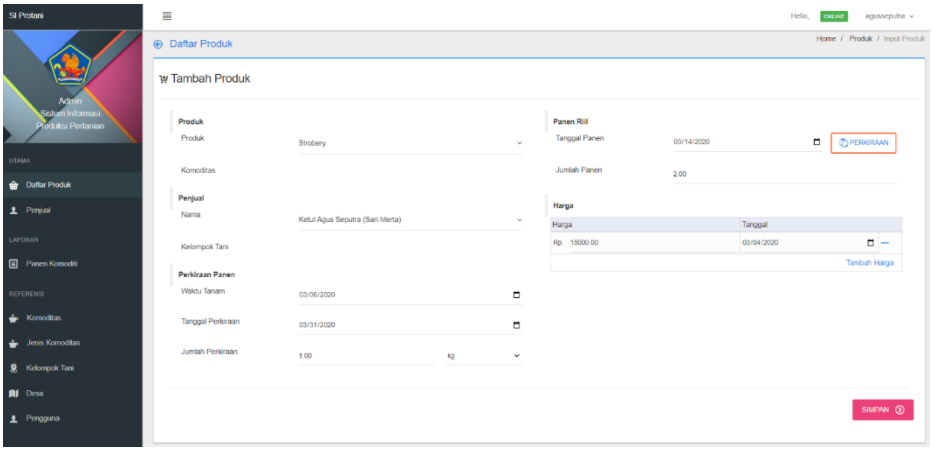

Figure 6. Adding Agriculture products.

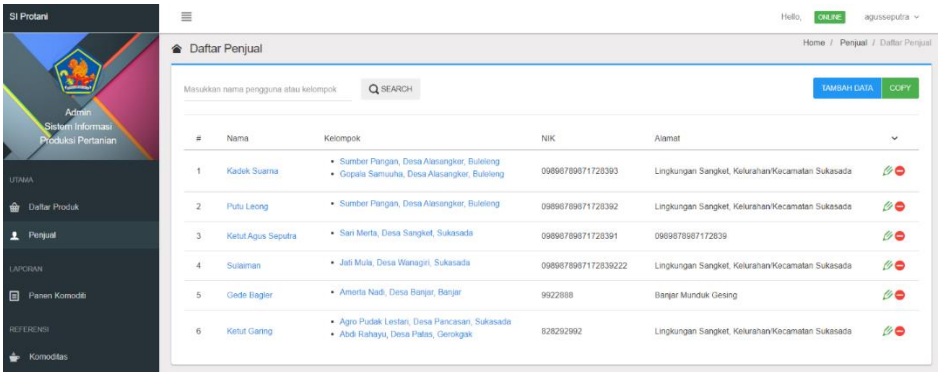

Figure 7. List of Sellers in Farmer Group.

From the explanation above, it can be concluded that the problem of the study, namely how to make designs and implementation of a web-based agriculture information system in Buleleng regency has already been completed well. The solution was made by following the steps according to the waterfall method.

4. Conclusion

The problem faced by Buleleng Agriculture Office is that agricultural products in the Buleleng regency have not been documented by applying a system that uses today's developing technology. The kind of technology needed is a technology that can present agriculture products in Buleleng regency up-to-date and can be accessed by anyone, whenever and wherever. A technology that facilitates this is the web. Hence in this study, the problem selected was how to make a design and implement a web-based agriculture products information system. To solve this problem the team of researchers used the waterfall method. The first step done was to write in detail the specification of the system's needs. Then, it was followed by writing a system design that consists of system design, database design, and display design. After writing the design, the next step was to implement it by creating program units. The program units were integrated into a complete system and tried out so that it meets the needs that have been specified in the beginning. Buleleng regency's web-based agriculture product information system has been implemented using Laravel framework and can be accessed online at http://siprotani.com. This system is still in the form in which agriculture products in the Buleleng regency are documented with their actors, namely general visitors, FAEAs, administrators, and consumers. In the future, this system can be developed further into a mobile-based system or a system that takes primary data that are related to agriculture through remote sensing and the development of geographical information system in which the attributes such as

ownership, soil fertility, planting pattern, etc can be attached to survey numbers in the map. In addition, to develop agriculture in general, there is a need to involve various institutions such as National Research Institution, universities that house faculties of agriculture, and other institutions that have an interest in agriculture.

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