

# Web-based information system design of agricultural management towards self-sufficiency local food in North Aceh

Salahuddin\*, Husaini, and Anwar

Department of Technology Information, Lhokseumawe State Polytechnic, Aceh, Indonesia

\* salahuddintik@pnl.ac.id

**Abstract.** The agricultural sector, especially food crops and horticulture, is one of the sectors driving regional economic pillars in Aceh Utara Regency of Aceh Province. Some agricultural products and food crops that become excellent products in North Aceh regency are: rice, corn, peanuts, long beans, cassava and soybeans. The Local Government of North Aceh Regency has not been optimal in empowering and maximizing the potential of agriculture resources. One of the obstacles is caused by the North Aceh Regency Government does not have an adequate database and web information system/GIS (Geographic Information System) for data management of agricultural centre in North Aceh Regency. This research is expected to assist local government of North Aceh Regency in managing agriculture sector to realize local food independence the region in supporting national food security program. The method in this research is using waterfall method for designing and making information system by conducting sequential process starting from data collection stage, requirement analysis, design, coding, testing and implementation system. The result of this research is a web-based information system for the management of agriculture superior agricultural product centre in North Aceh. This application provides information mapping the location of agricultural superior product producers and mapping of potential locations for the development of certain commodities in North Aceh Regency region in realizing food self-sufficiency in the region.

## 1. Introduction

Agricultural and food crops are a highly developed sector and play an important role in maintaining food security in Indonesia. As it has been well known that Indonesia has a natural wealth of biodiversity, it is endowed with fertile soil there are various agricultural commodities that is able to develop such as rice, maize, tuber, bean and soybean [4]. Surely this is in accordance with one of the government's programs to comprehend the economic independence by moving the domestic economic strategic sector through agricultural resources independently. It might occur by carrying out food sovereignty for the development of national food security through regional food self-sufficiency [2].

North Aceh regency is one of the districts in Aceh Province which prioritizes agriculture sector especially food crops and horticulture as one of the pillars of regional economic pillar. North Aceh has a wide agricultural area spread over 27 sub-districts planted with various types of plant commodities. The well-known crops and harvests of North Aceh are: rice, corn, peanut, long bean, cassava and soybean. Supporting the potential agricultural commodities in the agricultural sector that can be developed include: durian, langsung, rambutan, mango, grapefruit, lime, nutmeg and candlenut [3]. The local government of North Aceh yet has not optimally empowering and maximizing the potential of agriculture resources. One of the supporting factors obstacle is because the local government of North



Aceh has not yet built an adequate database and information system for data management of agriculture centre in North, as one of the leading sectors of local government in realizing local food self-sufficiency [13,14]. Subsequently, the North Aceh Government has not had a geographical information system (GIS) mapping for the regulation of the region in North Aceh Regency that has the potential to developing and mapping certain commodities in North Aceh [1]. This has an impact on the low availability of information to stakeholders in North Aceh and Aceh Province regarding to governance of agricultural centres in the regions [15-18]. The purpose of this research is to design and implement the information system of agricultural data centre management in North Aceh regency. Then the information system can be used as one of the solutions for the local government of North Aceh District in managing the agricultural sector to comprehend local food self-sufficiency in order to support the national food security program.

## 2. Literature Review

This literature review briefly contains the definition of information system, GIS, and centre of agriculture, respectively.

### 2.1 Information System

System is an interconnected network of procedures that performs an activity or to complete a certain target[6]. Additionally, information is data that is processed into a form that is more useful and more meaningful for those who receive it. The source of information is data; data is a reality that describes a real event and unity [8,10].

### 2.2 GIS (Geographic Information System)

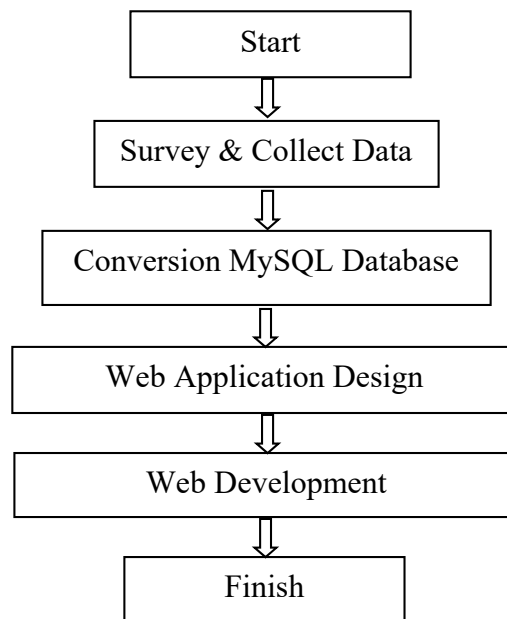
Geographic Information System is a specialized information system that build to manage spatial information data (spatial reference) or a computer system that has the ability to build, store, manage and display geo-referenced information, such as identified data by its location in a database [5,9]. Geographic information system technology can be used for scientific investigation, resource management, development planning, cartography and route planning [11,12].

### 2.3 Centre of Agriculture

The term agricultural centres can be defined as the certain areas that are projected to produce certain agricultural products such as rice, corn, soybeans and other food crops and horticulture [2]. In the Agricultural Development Master Plan 2015-2045, agricultural development in the next five years (2015-2019) refers to the agricultural for development paradigm that positioned the agricultural sector as a driver for a balanced and comprehensive development transformation demographic, economic, intersectional, spatial, institutional, and agricultural development transformations [7].

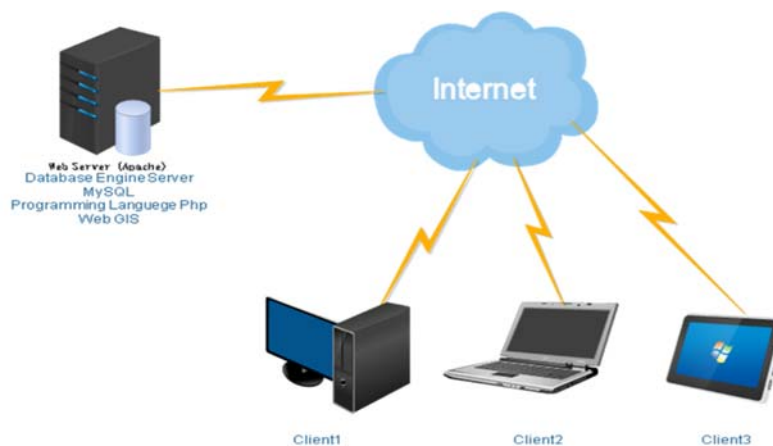
## 3. Research Methods

The development process of agricultural information system as part of agricultural centre in North Aceh District is illustrated in Figure 1. The used method in this study is based on literature study on agricultural governance in North Aceh, Indonesia. The data were obtained by collecting direct data originated from relevant agencies as well as from the relevant annual report on the North Aceh district agricultural office. Identification and verification respectively are the next steps that need to be conducted during the data processing phase. These stages are done to identify the aspect of data and precise information to ensure all data to be published in accordance with information system data standard. Then the database built stage is done using MySQL. All verified data is entered into the database. The publication of data and information services are the most important stage in the development of web-based agriculture centre information systems. To obtain the services of this web-based agricultural governance information system can be accessed from anywhere using common Internet browsers. This study used Google maps to display map to online data services information system website.



**Figure 1.** Flowchart of development process of agriculture website information system

The designed architecture of information system website to integrate information management of agriculture self-reliance center of North Aceh district is implemented by using MySQL database engine, Apache Web Server and supported by Google maps to display location. Figure 2 illustrates the architecture of the built system.



**Figure 2.** Built up system architecture

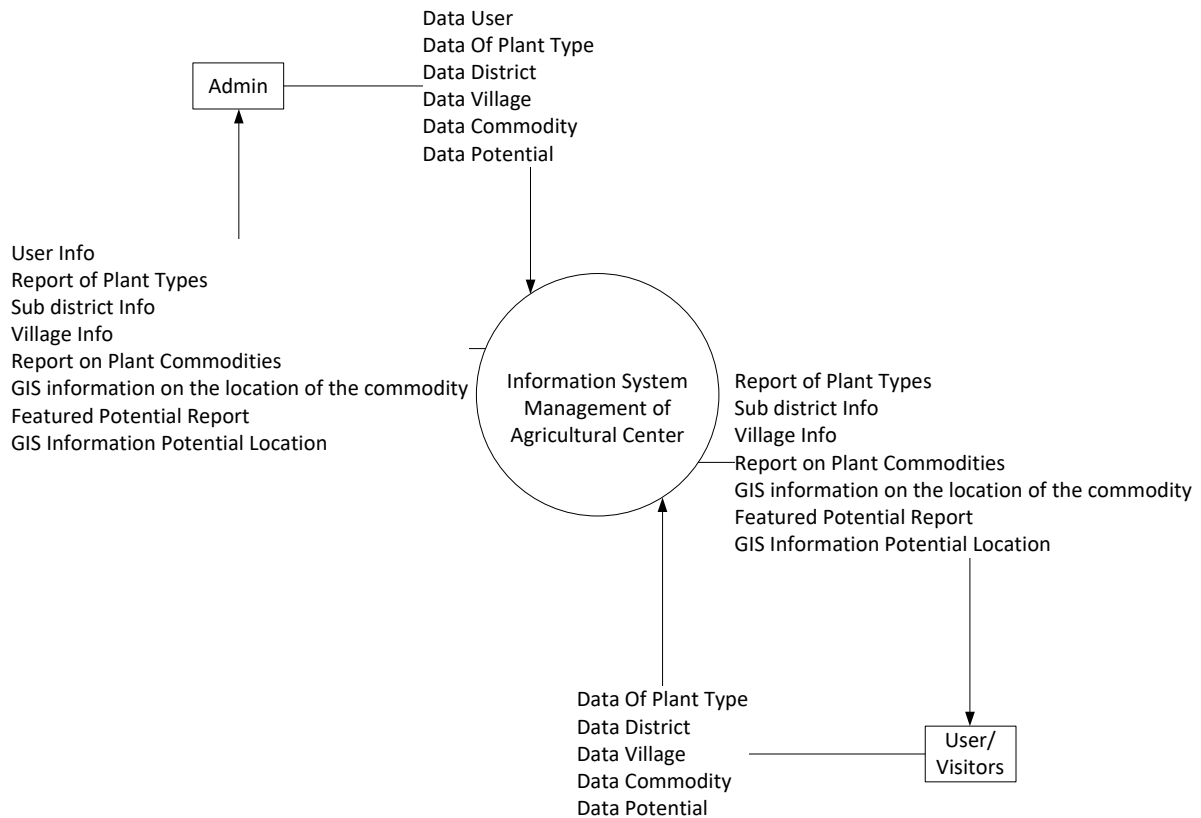
#### 4. Result and Discuss

The following discussions such as the model of agricultural management, data flow diagram level 0, and built up website pages, respectively are included in this section.

##### 4.1 Model of agricultural management

The application administrator operates the management of agricultural web information system. Administrator input user data plays role as user of system to entry the data of type of plant, sub district data, village data, and excellent commodity data, respectively. The excellent commodity data in north Aceh regency is being entry using GIS location parameters (coordinated in latitude and longitude).

Additionally, the entry data of potential of villages and sub-districts for development of certain commodities is also using GIS location as well. Finally, using GIS location the administrators can also access the application to obtain information services in the form of excellent commodities, location information of districts/villages, excellent commodity producers, sub-district and village that have particular potential to be developed in North Aceh district. Figure 3 illustrates context diagram of the agricultural information system of agricultural centres website. The result of this system is almost the same that produced by Huanqin which makes e-commerce for information system of agricultural ethnic characteristics with platform android [19].



**Figure 3.** Context diagram of management agricultural centres

#### 4.2 Data flow diagram level 0

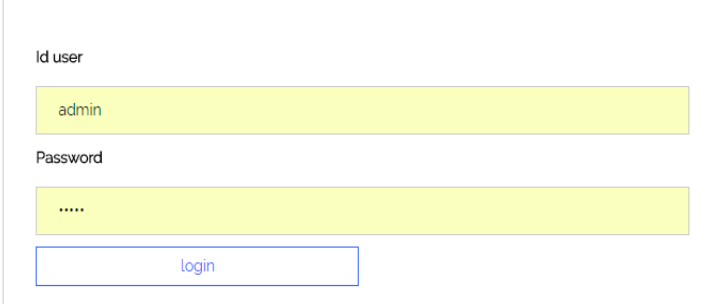
Data flow diagram level 0 is a process of data flow entered by administrators and users into the database system. Data entered by the admin is stored into different tables, namely: user D1, D2 type of plant, D3 districts, D4 villages, D5 plant commodities, and D6 excellent potential. The visitors (system users) is then able to use stored data to get detailed information on various leading agricultural commodities and agricultural development potentials in North Aceh District by entering keywords. Figure 4 illustrates data flow detailed process of agricultural information system centre.



After all the stages have been done, the GUI model information system application of agricultural management system centre website can be explained as follow :

#### 4.3 Built up website pages

To begin the entry data process into the application, the admin firstly must log in. The login page for admin is illustrated in Figure 5.

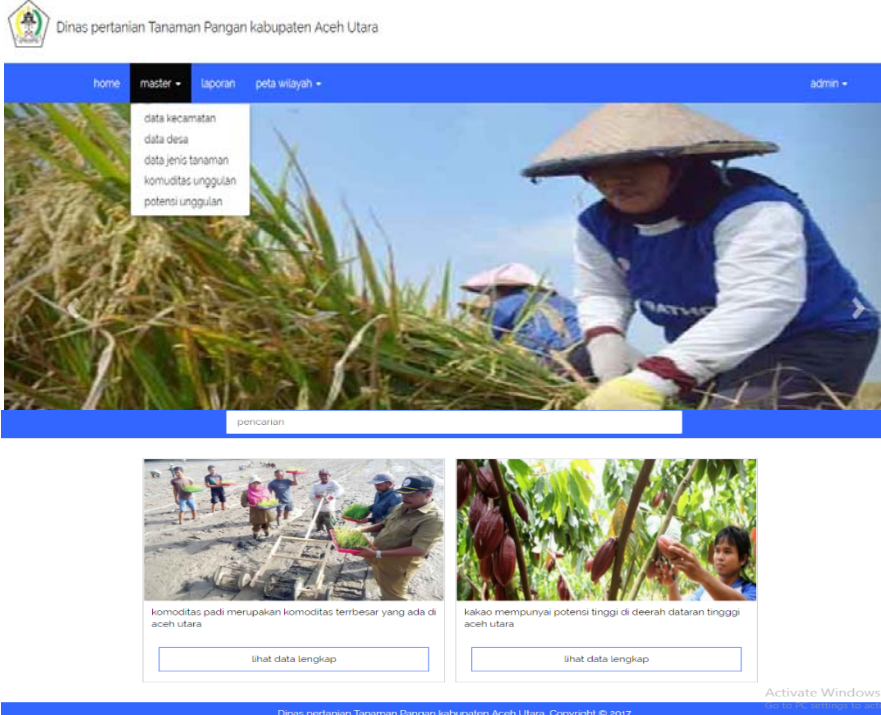


The image shows a login form with two input fields and a button. The first field is labeled 'Id user' and contains the text 'admin'. The second field is labeled 'Password' and contains six dots. Below the fields is a button labeled 'login'.

**Figure 5.** Admin login page

##### 4.3.1 Main page

Once the admin logs in to the system, he can select the menu options contained in the application consisting of the main menu for main data management including sub-district management, village, plant species, commodities, and excellent potential data. On the main page there is also a report (output) that can be displayed by the application as well as GIS map to view the commodity areas of excellent commodities, as well as information search menu of agricultural commodities and its location contained in North Aceh District by entering certain keyword commodities. The main page of the system is illustrated in Figure 6.



The image shows the main page of the system. At the top, there is a logo for 'Dinas pertanian Tanaman Pangan kabupaten Aceh Utara' and a navigation menu with 'home', 'master', 'laporan', and 'peta wilayah'. Below the menu is a large image of a person wearing a traditional hat working in a field. A search bar is located below the image. Below the search bar are two featured articles: 'komoditas padi merupakan komoditas terbesar yang ada di aceh utara' and 'kakao mempunyai potensi tinggi di daerah dataran tinggi aceh utara'. Each article has a 'lihat data lengkap' button. At the bottom, there is a footer with 'Dinas pertanian Tanaman Pangan kabupaten Aceh Utara. Copyright © 2017' and 'Activate Windows'.

**Figure 6.** Main page of the built up system

#### 4.3.2 District form

To manage and entry the data of districts in North Aceh, this form is used. It is also can be used to edit and delete the data. This form is illustrated in Figure 7.

No	id kecamatan	nama kecamatan	Pilihan	
1	001	Samudera	<a href="#">edit</a>	<a href="#">hapus</a>
2	002	Lhoksukon	<a href="#">edit</a>	<a href="#">hapus</a>
3	003	Syamtalira Bayu	<a href="#">edit</a>	<a href="#">hapus</a>
4	004	Syamtalira Aron	<a href="#">edit</a>	<a href="#">hapus</a>
5	005	Sawang	<a href="#">edit</a>	<a href="#">hapus</a>

Figure 7. Designed of district form page

#### 4.3.3 Village form

To manage, edit, delete the village data, the form that illustrated in Figure 8 is used. All the entered data is the villages in North Aceh district.

No	Id Desa	Nama Desa	Id Kec	Pilihan	
1	Babah0	Babah Krueung	005	<a href="#">edit</a>	<a href="#">hapus</a>
2	Blan01	Blang Cut	005	<a href="#">edit</a>	<a href="#">hapus</a>
3	Blang0	Blang Teurakan	005	<a href="#">edit</a>	<a href="#">hapus</a>
4	Gunc01	Gunci	005	<a href="#">edit</a>	<a href="#">hapus</a>
5	Juro01	Jurong	005	<a href="#">edit</a>	<a href="#">hapus</a>
6	Kubu01	Kubu	005	<a href="#">edit</a>	<a href="#">hapus</a>
7	Laga01	Lagang	005	<a href="#">edit</a>	<a href="#">hapus</a>

Figure 8. Designed of village form page

#### 4.3.4. Excellent commodities page

The excellent commodities form is used to entry and manage the data of all commodities in North Aceh. They are including the varieties, areas, annual agricultural productions, villages, and districts, based on the latitude and longitude. The page is illustrated in Figure 9.

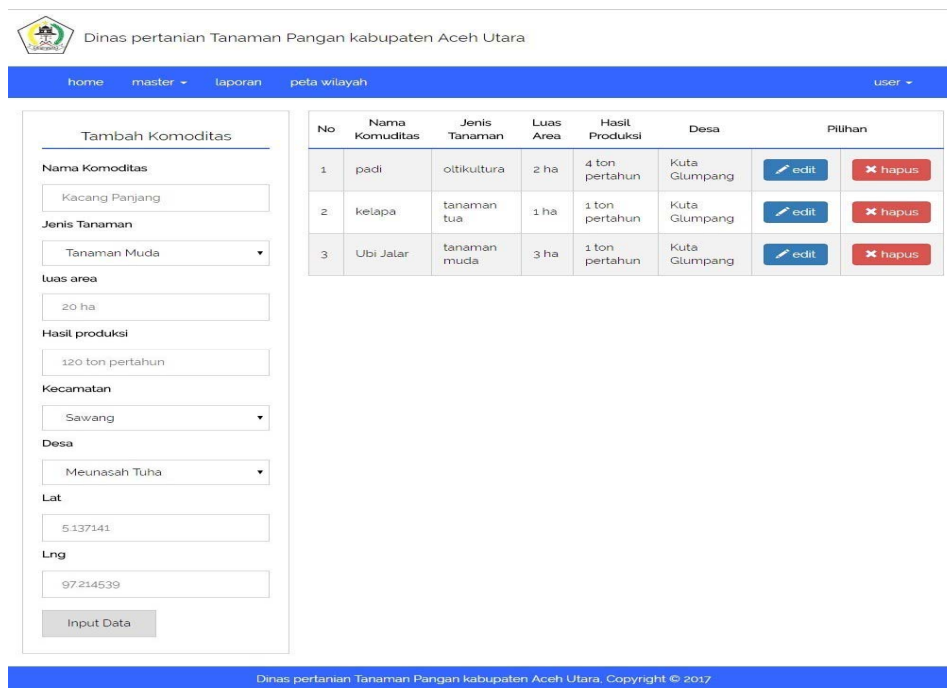


Figure 9. Designed of excellent commodities page

#### 4.3.5 Potential commodities page

The potential commodities page is used to entry, manage, edit and delete the data of potential agriculture commodities that is developing in the North Aceh district. They are including the area, type of commodities, villages and districts. Figure 10 illustrates the page in detailed.

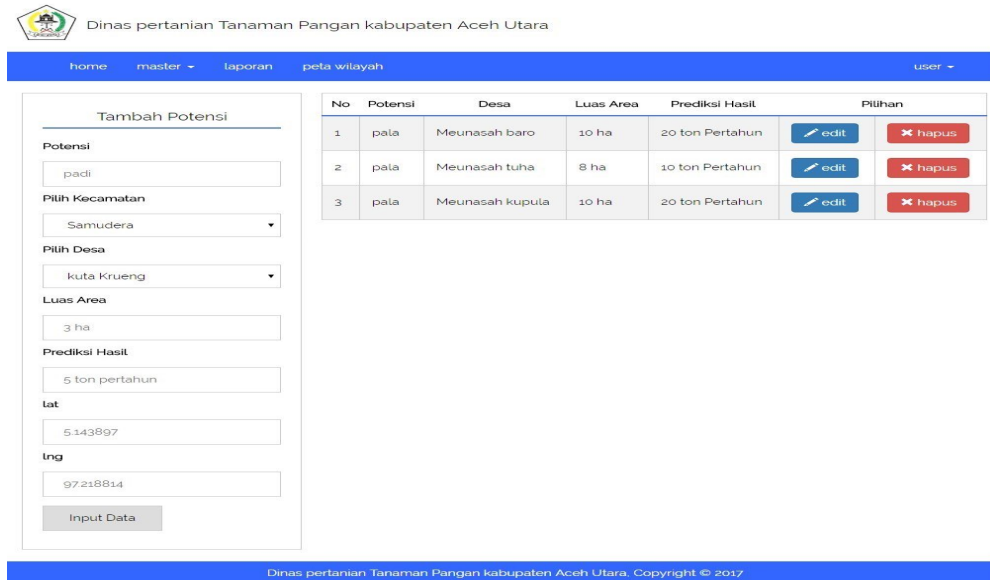


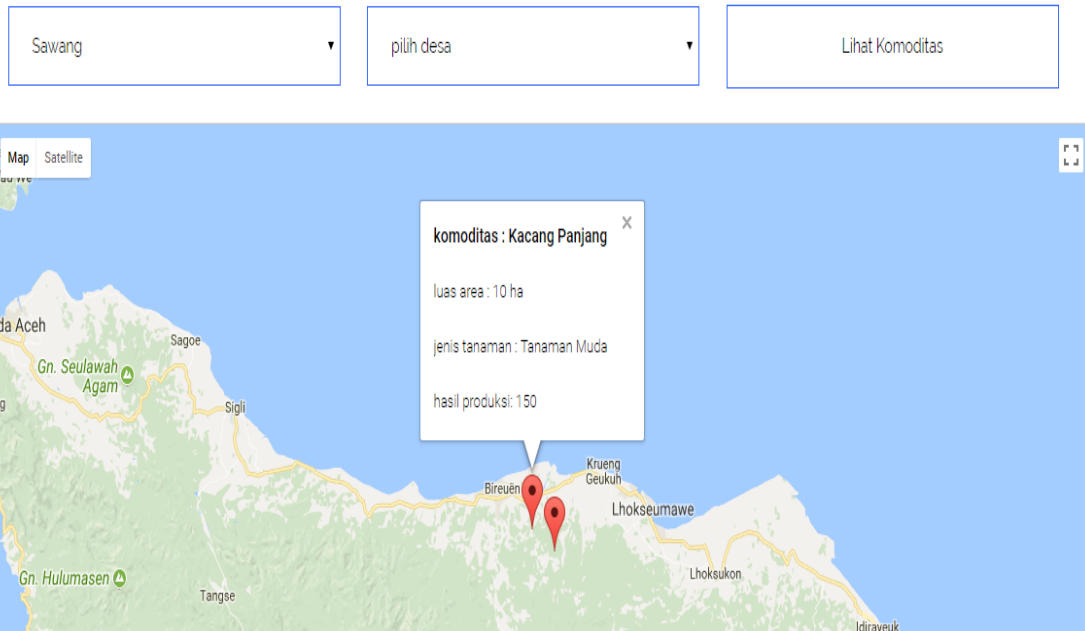
Figure 10. Designed of potential agriculture commodities page

#### 4.3.6 Searched map

A map view as the result of searching engine of the region is used to locate and obtain information on existing agricultural commodities in North Aceh District, is illustrated in Figure 11. Users can also find specific commodity information that has the potential to be developed in the North Aceh area. The searching engine results are displayed in the form of maps of village locations, sub-districts and commodity information. Users of the system/stakeholder or local government to locate areas that have

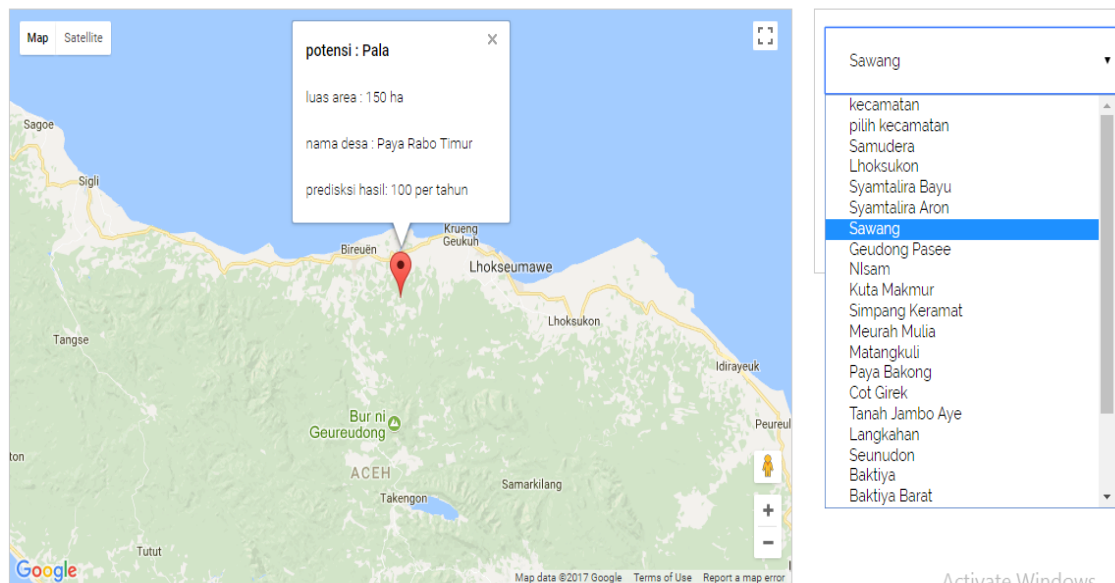


the potential to develop certain commodities in North Aceh District can use this feature. The GIS potential search feature is illustrated in Figure 12.



**Figure 11.** Searched location of excellent commodities page

potensi Unggulan



**Figure 12.** Searched location of potential agricultural commodities page

In this website application, there is still a drawback of the system that has not yet been able to solve. Providing information regarding the distance to the location that appeared on the application (e.g., from the capital district to the location of potential commodity producer) is become the author priority to further expand this website.

## 5. Conclusion

This research has developed a website information system of agricultural management that can provide information and facilitate the user in management of agricultural centre in North Aceh district. The provided facilitations in this website is to find the location information of agricultural excellent commodities producer in area and potential area location for certain commodity development in North Aceh order due to recognize food self-sufficiency in the region. Although this designed website has a drawback, i.e., no distance appeared, but the data is provided accurately.

## 6. Acknowledgments

Authors thank to Research Grants from Indonesia Directorate General of Research, Technology and Higher Education (DRPM Dikti) for funding this research.

## 7. References

- [1] Anonymous, 2013 *Exploring Agricultural Potential in North Aceh Region*. Bappeda Regency of North Aceh.
- [2] Food Security Agency, 2014 *Program Focus and Food Security Activities for Fiscal Year 2015*.
- [3] Department of Agriculture of Food Crops and Livestock of North Aceh, 2012 *Agricultural potential in North Aceh*.
- [4] Gunawan, Saiful Bahri, Adian, Riswanti 2012 *J. Ind. Food and Agr. Eng.* **11** 18-21.
- [5] Li G, Zhou K, Wang J, Sun L, Wang Q, Qin Y 2010 *Int. Conf. ICISE*.**41** 56-60.
- [6] O'Brien, 2010 *Introduction to Information System, Eight Edition*, McGrawHill, New York, USA.
- [7] Ministry of Agriculture, 2015 *Regulation the Minister of Agriculture of the Republic Indonesia*.
- [8] Joo J, Hovav A 2016 *Int. J. Tech. Inf.* **22** 94-116.
- [9] A A Kadir, M Kaamin, N S Azizan 2015 *Int. Conf. Eng.* **67** 4-10.
- [10] A Y Iskhakov, R V Meshcheryakov 2016 *Int. J. Inf. Tech.* **52** 7-11.
- [11] N Yasmin, Ismail A, Rosfazreen 2016 *Int. J. Eng.***76** 2614-37.
- [12] F. Abdul, H. Xu, P. Gao 2016 *Int. Conf. Ear and Env. Sci.* **110** 45-51.
- [13] Kun Wang, Yan F 2017 *Int. J. Physics.* **887** 1-6.
- [14] Weishui Yu, Changshou Luo, Yaming Z, Qingfeng W, Chengzhong C 2017 *Int. J. Mat. Sci. and Eng.* **231** 1-6.
- [15] Ahmed GB, Rashid A, Balasundram SK, Abdullah AF 2016 *Int. Conf. Env. Sci.* **012044** 1-8.
- [16] Fucheng Wan, Ning Ma, Dongwei Y, Zhangyuan X 2017 *Int. Conf. Ser. Mat. Sci. and Eng.* **231** 1-8.
- [17] S Y J Prasetyo, Y H Agus, C Dewi, B H Simanjuntak, K D Hartomo 2017 *Int. J. Sci. and Eng.* **180** 2-9.
- [18] Nizamuddin, Hizir, Ardiansyah, D Pertiwi, Handayani P 2016 *Int. J. Ear. and Env. Sci.* **56** 1755-1315.
- [19] Wu Huanqin, Jin Yasheng, Dai Yugang 2017 *IOP. Int. Conf. Ear. and Env. Sci.* **69** 1-7.

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.