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GEOGRAPHIC INFORMATION SYSTEM OF CROPS

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Abstract. Crops is one of agriculture part will be needed in the lives of human being. Food is a basic requirement for humans to be able to maintain life and hence the adequacy of food for every person at all times. Food security is a condition where the availability of food is sufficient for their food needs. It will continue to maintain the sustainability of food consumption and also help balance a fluctuation in prices and production of crops. Food availability is one aspect that exists in food security that is intended to fulfill a food need. Food security have several aspects, such as food availability, coverage, stability and quality of consumption. Mapping food security using Geographic Information System is important, by knowing the situation of food in the region, both the government and other institutions can make policies that are right on target. The objective of research will make a geographic information system related to food crop mapping to pay attention conditions of food security and can see the potential of food crop production from a sub-district that have high productivity especially for rice, cassava, sweet potato, soybean.

1.INTRODUCTION

Plant product that can be grown and harvested for profit called crop. By use, crops divided into six categories: food crops, feed crops, fibre crops, oil crops, ornamental crops, and industrial crops. Food crops, such as fruit and vegetables, are harvested for human consumption. Grains, such as corn, wheat, and rice, are the world's most popular food crops. Food crops were the first crops to be harvested through agriculture. Agricultural development and the growth of civilizations led to the diversity of other types of crops [1]. Today, the great challenge for the coming decades will be the task of increasing food crops production to ensure food security available for a human being [2].

Geographic Information Systems are able to create a map and a project current and future fluctuations in precipitation, temperature, crop output, and more. By mapping geographic features of current (and potential) farmland scientists and farmers can work together to create more effective and efficient farming techniques; this could increase food production in parts of the world that are struggling to produce enough for the people around them. GIS can analyse soil data combined with historical farming practices to determine what are the best crops to plant, where they should go, and how to maintain soil nutrition levels to best benefit the plants [3]. A technological tool for comprehending geography and making intelligent decisions can be used a geographic information system (GIS). Making intelligent decisions based on geography is basic to human thinking. GIS organizes geographic data so that a user can read a map and select data that necessary for a specific project or task such as in Crops area [4].

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Jember is one of the regencies located in the eastern part of the province of East Java, Indonesia. In Jember Regency, it is difficult to increase the amount of agricultural land and reduce the population rate, but it needs to be followed up namely a strategy to solve food security on existing land. In Jember Regency various types of horticulture plants can be found and developed by the community. However, the potential possessed, has not fully been able to make a major contribution to efforts to increase food security [5].

Based on the above problems, a Geographic Information System of Crops in Jember Regency will be made on a Website based. The purpose of this study was to determine the priority direction of the development of the crops sector, mainly to determine the most appropriate types of commodities for each land unit that serve as local agricultural base in Jember. From making the application, it is expected that the government of Jember Regency will pay more attention to the condition of food security and be able to see the potential of food crop production from an area that has high productivity.

2.WORKING METHODOLOGY

The research method in designing the Geographic Information System Crops in Jember Regency Based on Website using Prototype Methodology. Where the stages are Communication, Quick Plan, Quick Design Model, Construction of Prototype, Deployment, Delivery, and Feedback for the final stage. The prototype methodology given benefit from user input as a working model of the system is provided, user gets a better understanding of the system that is being developed, errors and risks can be detected at a much earlier stage, as the system is developed using a prototypes [6]. Prototypes are essential in product development to create, explore, describe, test and analyse the item being designed [7].

2.1 Communication

An ideation was selected due to the frequent demand for the explanation and communication of ideas and other design concepts, ensuring sufficient depth for later analysis so communication have important role in prototype stage [8]. The communication phase by interviews to the Jember District Agriculture Office. Came from interview, The problem that will be solved regarding food security with the aspects reviewed is food availability based on the amount of food crop production. Then an observation was made by observing data at the Central Statistics Agency in Jember and Jember in Figures.

2.2Quick Plan

At this stage, a design of features that had been discussed in the interview stage was done on the issue of food security with aspects discussed related to food availability based on the amount of production, and also conducted a validation of data previously taken from BPS (Central Statistics Agency) for authenticity.

2.3Modelling Quick Design

System design which is carried out of prototype method stage is proposed a system flowchart design that is equipped with several system designs, database design and also some interface design. Here is the design of the system described in the form of a flowchart. The flowchart figure 1. serves as the central design document around which systems analysts, computer programmers, and end-users communicate, negotiate, and represent complexity.

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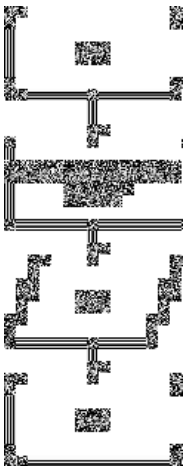

Figure 1 Flowchart for Modelling Quick Design

2.4Construction of Type

At this stage an implementation of all designs is made into the programming language. Since the Food Crop Geographic Information System is website based, all existing designs will be implemented using the PHP programming language which can later be used through the website platform using CodeIgniter. CodeIgniter is the only framework among the frameworks used in this experiment that does not have an installer. To use it, the whole framework bundle has to be installed. Once the configuration file is set up, the models, views and controllers have to be created manually. The convention is to create a PHP file and place it in the controller's folder and the same is for views and models [9].

2.5Deployment Delivery, and Feedback

The final stage is testing the application of Geographical Information Systems and evaluating the results of system. However, it has been agreed that it has been completed and as client needed then application can be launched. Medium to large case product software vendors are presented and evaluated using the model, thereby uncovering issues in their release, delivery, and deployment processes [10].

3.EXPERIMENT AND RESULT

Based on methodology prototype Information Geographic system can be explain by

3.1 Communication

In this communication stage, an interview was made to the Jember District Agriculture Office regarding the issue of food security with the aspects discussed were related to food availability based on the amount of food crop production. During the interview stage, the activity carried out was to provide a questionnaire for the validation process of food crop data and also the amount of production. It also concerns the data of each sub-district in Jember Regency. In addition to conducting an interview stage with the Department of Agriculture, there is another stage carried out in this communication stage, namely observations to obtain data on food crops and also the amount of production in each district in Jember Regency.

3.2 Quick Plan

From the features mentioned earlier are part of the Administrator for the application data section. Then there is also a super admin section which can manage the map and also user management that is useful in managing and storing user data to be used to log in to the website page, as well as storing the geographical map data complete with the names of sub-districts in Jember Regency.

3.3 Modelling Quick Design

This stage is describing the flow of the application system with the interface to the user. This description aims to explain clearly and also to make it easy to understand the flow of the system.

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The design of the model to illustrate the flow of this system using DFD (Data Flow Diagrams) and for database design using ERD (Entity Relationship Diagrams). From the ERD design figure 2, it can be explained that there are 5 tables, namely: tbl_user to manage user, tbl_map to explain about Jember mapping, tanaman_pangan appear from many to many the other table cardinality, data_pangan to input, edit and delete data food crops and tbl_index_tahun to filter year needed. Figure 3 explain about user who can use this application administrator, superadmin, pengguna. Administrator can input and view food crop data, input and view food data, input and view year index data., can see productivity charts where graph data is obtained from existing data.Superadmin can input and view user management data, input and view map or geographical data. Later it is related to mapping for the map or geographical data. User can see the results of the mapping of data - data that has been inputted.

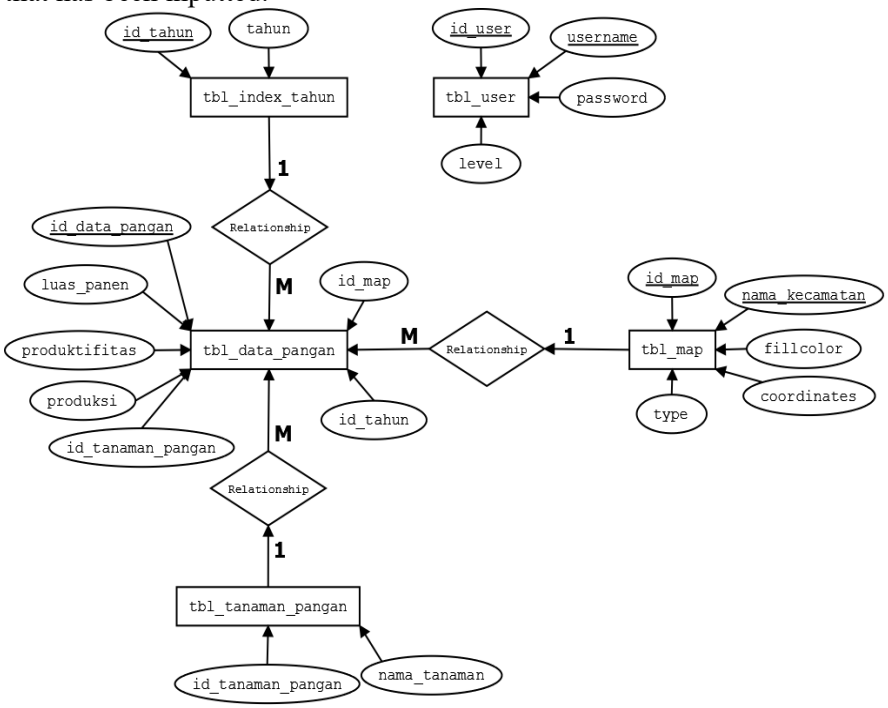

Figure 2 Entity Relationship Diagram

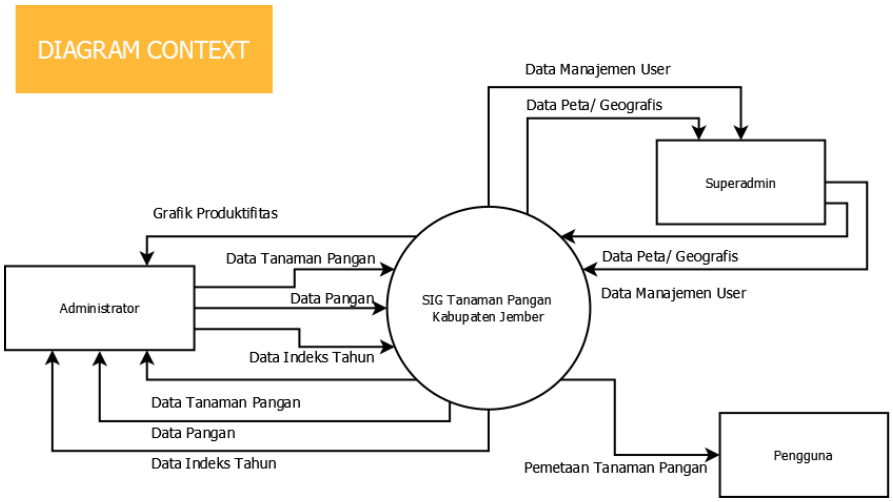

Figure 3 Diagram Context

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3.4 Construction of Type

At this stage the application of the design into a programming language that has been determined in accordance with the design that has been made.

```
1.  public function prosesLogin(){
2.  $user = $this ->input ->post('username');
3.  $pass = md5($this ->input ->post('password'));
4.  $val_user = $this ->ModelLogin ->cek_user($user);
5.  if($val_user != 0){
6.  $val_pass = $this ->ModelLogin ->get_user($user)-
    >row_array();
7.  if($val_pass['password'] == $pass){
8.  $this->session ->set_userdata('logon', true);
9.  $data = $this ->ModelLogin ->get_user($user)->row();
10. if($data->level == 1){
11. $sess = array('level'=>'1','name'=>$data->username);
12. $this->session->set_userdata($sess);
13. redirect('Admin');
14. }else if($data->level == 2){
15. $sess = array( 'level'=>'2', 'name'=>$data->username);
16. $this->session->set_userdata($sess);
17. redirect('Superadmin');
18. }else{
19. echo "no akses";
20. }
21. }else{
22. redirect('login');
23. }
24. }else {
25. redirect('login');
26. }
27. }
```

3.5 Deployment Delivery, and Feedback

This fifth stage is the testing phase of iteration, namely the administrator login and super admin whether it is as expected or has not yet achieved the desired results. And this test uses the black box method.

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Figure 3 Login Menu

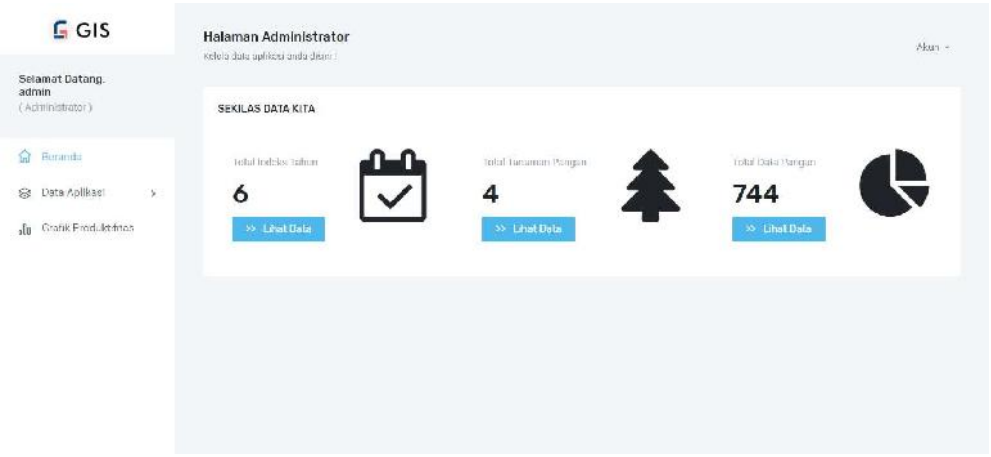

Figure 4. Administrator Menu

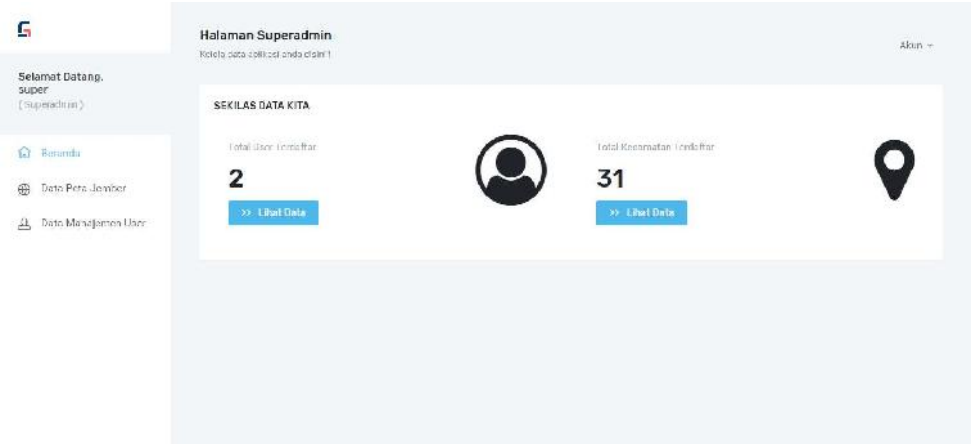

Figure 5. Superadmin Menu

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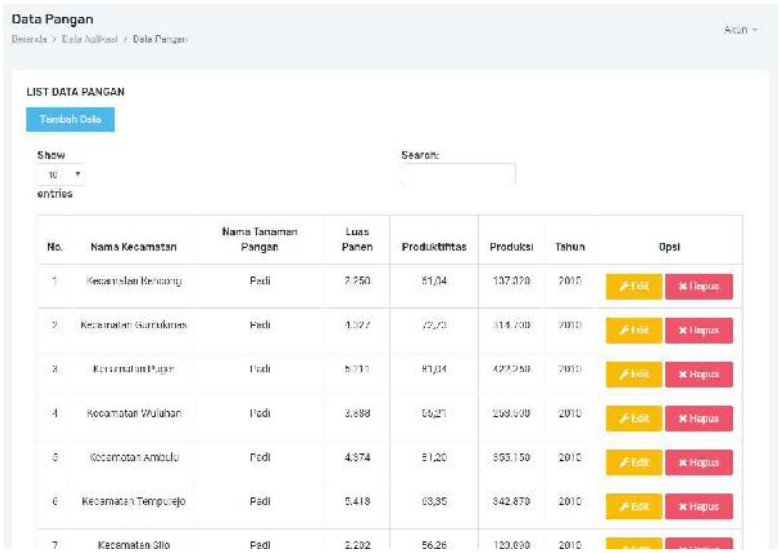

Figure 6. List of Food Crops

Figure 7. Productivity Graph

Figure 8. Filter Year and Region

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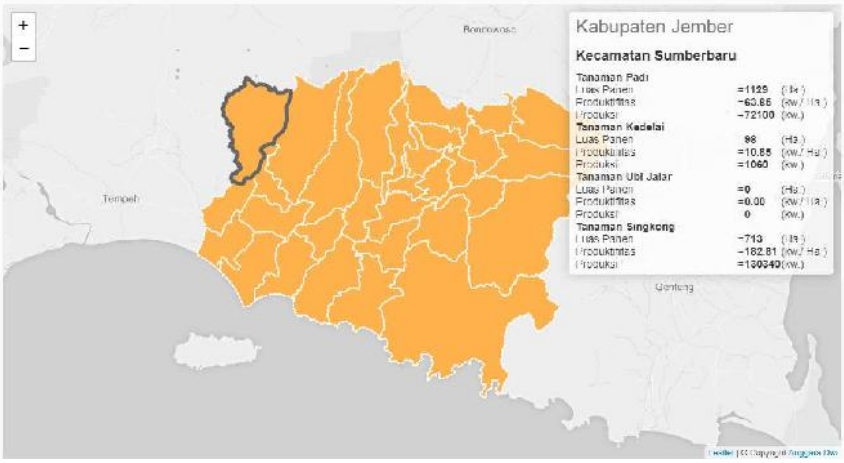

Figure 9. Result Mapping

In the results of this feedback the percentage of scores obtained from filling out the questionnaire by the users after testing the application to them, which has been tested on 15 respondents with 8 respondents in detail from non-IT users where of the seven people 2 of them from the Department of Agriculture . Then 7 people from users who are basically IT people. From the figire 10 data obtained from table 4. 20 and also in figure 4. 20 it can be seen that the average data can be concluded with a detailed value of 63 for question 1, 65 for question 2, 69 for question 3, and the value an average of 4.2 for question 1, 4.3 for question 2, 4.6 for question 3.

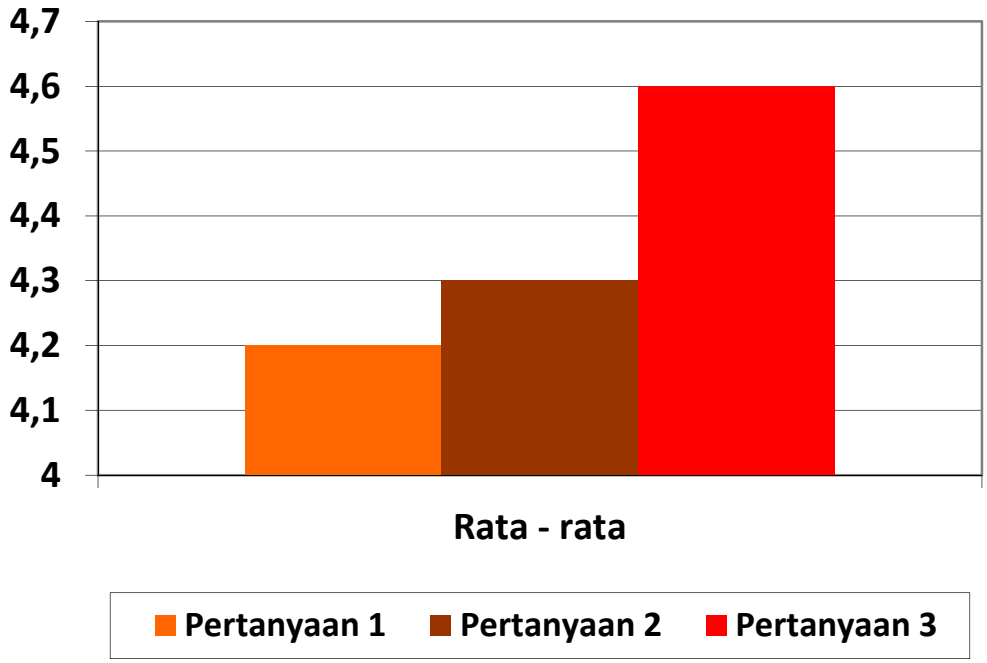

Figure 10 Graph of Feedback Respondents

4.CONCLUSION

Based on the final results of the discussion about the application of Geographic Information Systems or Food Plants in Jember Regency Web-Based that can be concluded namely: make it easier for users to see food data in each region in Jember Regency and can also be more specific in viewing data either from year or region from the mapping feature. The amount of food crop production can

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be mapped using the PHP programming language with existing digitization data can see the potential of food crop production from a sub-district that have high productivity. On the food data menu on the administrator dashboard, productivity data can be seen based on the highest food crops by using the search form or filter in the production field.

REFERENCES

[1] National Geographic. 2011. Crop. https://www.nationalgeographic.org/encyclopedia/crop/.
[2] Tarek B H and Hamid E B. 2019. Food Security in The Gulf Coorperation Council Countries: Challenges and Prospects. Journal of Food Security. Vol 7 No 5. Page 159-169. Published by Science and Education Publishing. DOI:10.12691/jfs-7-5-2.
[3] Elizabeth B. 2014. Use of GIS in Agriculture. https://www.gislounge.com/use-gis-agriculture/
[4] ESRI. 2009. GIS Best Practice: GIS for Agriculture. New York. https://www.esri.com/library/bestpractices/gis-for-agriculture.pdf.
[5] Damanhuri, Budi H, Trismayanti D P. 2018. Application to Forecast Attacks On Plant Distributing Organism. The First International Conference on Food and Agriculture. Page 370 – 375. ISBN 978-602-14917-7-5.
[6] Shikha V. 2014. Analysis of Strengths and Weakness of SDLC Models. International Journal of Advance Research in Computer Science and Management Studies. Vol 2. Issue 3. Page 235-240. ISSN: 2321-7782.
[7] L. S. Jensen, A. G. Özkil and N. H. Mortensen. 2016. Prototypes in Engineering Design: Definitions and Strategies. International Design Conference-Design 2016. Page 821-830.
[8] Cash, P and Maier, A.2016. Prototyping with your hands: the many roles of gesture in the communication of design concepts. Journal of Engineering Design. Page 118 – 145. DOI 10.1080/09544828.2015.1126702.
[9] Jone, S. 2015. Comparing Performance of Plain PHP and Four of Its Popular Framework. Thesis Project. Linnaeus University.
[10] Slinger, J and Sjaak, B. 2005. Definition and Validation of th Key Process Areas of release, delivery and development for product software vendors: turning the ugly duckling into a swan. technical report UU-CS-2005-041. www.cs.uu.ll

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