Interpretation of Food Crop Growth Progress Visualization and Prediction of Drone Based Production Estimates Based on Histogram Values in Government Areas - Case Study of Merauke Regency.

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Abstract. Farming is one of the pioneers of national development that plays an important role, especially Merauke Regency, which is planned to be the area for national food self-reliance in agribusiness (Indonesian). Government is currently very difficult. Will see the latest developments in the growth of food crops in the region, starting at the village level / kelurahan to the national level. These kindergartens growth in the crop until harvest time, and several obstacles to failure of crops from pests and environmental conditions such as flooding. Production estimates are easy if this information is available. The research aims to be able to show the status of the land in the form of different colors by the histogram method, plant information and the type of pest disease, while the retrieval of data is carried out using the photographic images. The long-term proficiency based on the coordinates through the GPS found on the Dji-Phantom Phantom device can also be used to calculate the area of land as the main parameters and requirements of the seed, the condition of the land and restrictions b. The failure of crop cultivation as a supporting parameter to determine the assessment of plant production by means of liver methods.

Keywords— Progress, Estimation Agricultural Products, Method Hiversine, Histogram.

1. Introduction
Agriculture in Indonesia has a vast food area and rice varieties from various types of foods such as soybeans, tubers and beans. However, there is no system that shows the progress of food plant growth in different regions, especially rice plants, which are the main ingredients of most Indonesian people.

The availability of information about the progress of food crops received from the Department of Agriculture is a barrier for local governments. One attempt to meet the information needs is to establish a system to see the progress of food crops, which is one of the main processes of finding what food plants should be produced for a certain period of time, [1]. There is a progressive visualization system to find out whether the food plants that need to be used are complete so that they become the basis for policy decisions about food, [2].

Various procedures are used to map agricultural produce from simple methods to the use of advanced technology that is currently available. One of the main applications of remote sensing is agricultural inspection or management. For example, use remote sensing techniques to calculate the number of palm trees, [3]. In satellite imagery, it is used to evaluate the biomass of the above-ground secondary forest in Brazil, [4]. With the use of remote sensing, many agricultural inspections are
possible and worthwhile. In addition, remote sensing can also be used to detect plantations, [5] and forecasting of yields, [6].

In the use of satellite images, weaknesses are almost identical to the weaknesses found in remote sensing methods, which generally depend on weather conditions such as rain, clouds and fog caused by the work of the area. From the results of crop production from villages to sub-districts to the provincial level through a system created, it will display information about the development of food crops in different regions at each planting period.

Development of rice growth

Some developments of the growth of the rice plant from the beginning of planting to the harvesting period with the characteristics of the spectrum vary when viewed using satellite images of Landsat TM among them. [7].

2. Development of Padi Age Growth

There are many developments in the growth of rice from the beginning of planting to the harvest of various spectra. If checked using Landsat TM satellite images such as.

a) The initial development of rice cultivation is dominated by Landsat TM images with true color mixing elements (TCC). Rice fields appear in blue.

b) Development of the second phase of plant growth marked with thick rice leaves covering the entire area at this stage, the area covered with green This green color will appear green in the image.

c) The third stage of the growth of the stem, which is a field with green leaves, will be replaced by a light yellow rice color in the TCC.

d) The fourth step of development is the land that will be rice for a period of time. Rice paddies will appear as reddish brown in the TCC color composition.

The development of the rice plant until the harvest can be estimated by using Landsat satellite images, if referring to the average age of rice between 110-120 days, with follow-up from beginning to planting, step-by-step changes until entering the harvest period.

Figure 1. Development of the age of rice growth
(a). The initial stage of growth,
(b). Plant growth stage vegetative
3. Ingredient and Methods

3.1. Ingredient

a) Google Maps

Google Maps is an online map service provided by Google. This service can be accessed via the official website. On the website, we can see geographic information in almost all regions of the world. This service is interactive because it has maps that can be scrolled as the user wants to change the zoom level and change the appearance of the map. Google Maps provides a very accurate map. The mapping system also has regular map options and satellite maps, [8].

b) Drone DJI Phantom 3

Drone is a plane used to hide without a crew. However, drone can be controlled by controlling or controlling from another location using a remote control. You can also set it to fly automatically. DJI Phantom understands that it is a tool commonly used in aerial photography, also known as aerial shooting. The DJI Phantom 3 standard comes with GPS-Assisted Autopilot system and GPS integration that can improve stability. In addition, if GPS is enabled, Phantom 3 will remember the location that was first activated. In addition, some support features are very useful in making remote photos that require GPS positioning and mapping areas as well as commands. Precise Rotate the command to make the drone change the position of the camera to tilt so that you can see it wider. [9], can process results in the production estimate.
Aerial photography by DJI Phantom has advantages and disadvantages. The advantage that digital images increase is because of the advantages of digital images, including the ease of photography, image creation, image processing, and more. But not all digital images are available. Visual effects that respond to the human eye due to the noise of the quality of light in digital images that are too dark or bright. Therefore, there is a way to improve the quality of digital images.

3.2. Methods
a) Histogram

Histogram is a graphical display to show the distribution of information with different eyes or frequencies occurring in the data set. Histogram is a tool for quality control. The benefit of using histograms is to provide information about changes in the process and help manage decisions in an effort to improve sustainable processes,[10]. The histogram adjustment is used to obtain the histogram of our needs. According to the computational level of digital image processing, the histogram modification includes worldwide usage.

- Histogram alignment (Histogram equalization) The intensity value in the image will change so that the diffusion is the same (the same).
- Histogram specifications (Histogram specifications) the intensity values in the image have changed to get the histogram along with the form specified by the user.
Leaf Color Chart (LCC) is the leaf color standard issued by the International Rice Research Institute (IRRI), [11]. LCC commonly used to determine the nitrogen content of plants so that they can be later known when the time of fertilization and harvest is correct. In order to improve the image quality in terms of color contrast, we can treat the histogram. The treatment referred to in this article is the histogram equalizer on the gray image. The histogram of the image is said to be good if it can relate to all possible levels or levels in gray. Of course, the goal is to be able to show the details of the image for easy observation.

b) Haversine

The position on the earth can be displayed by the latitude and longitude position. To determine the distance between two points on the earth according to the position of the latitude and longitude, use the formula of all formulas used according to the shape of the spherical world by eliminating the factor that the Earth is slightly elliptical. (Oval factor)

\[ \Delta \text{lat} = \text{lat}_2 - \text{lat}_1 \]
\[ \Delta \text{long} = \text{long}_2 - \text{long}_1 \]
\[ a = \sin^2(\Delta \text{lat}/2) + \cos(\text{lat}_1) \cdot \cos(\text{lat}_2) \cdot \sin^2(\Delta \text{long}/2) \]
\[ c = 2 \cdot \text{atan}^2(\sqrt{a}, \sqrt{1-a}) \]
\[ d = R \cdot c \]

Description:

- \( R \) = the radius of earth 6371(km)
- \( \Delta \text{lat} \) = the amount of change in latitude
- \( \Delta \text{long} \) = the amount of change in longitude
- \( c \) = axis intersection calculation
d = distance (km)
The above haversine formula is created when the accuracy level of the calculation results is still very limited, but now computer computations can provide a very accurate accuracy level, so using the simple spherical rules of the cosine formula Enabling us to accurately locate.

\[
d = \text{acos}(\sin(lat1)\sin(lat2) + \\
\cos(lat1)\cos(lat2)\cos(long2-long1)).R
\]

c) Polygon
The polygon method is one way to determine the horizontal position of multiple points at one point and other points connected to the distance and angle to create a set of angles of points. (Polygon)

Begin
- Tracking Coordinate Point Values (t)
- For i = 1 to t do
- \( x = \text{Value Latitude}[i]; \)
- \( y = \text{Value Longitude}[i]; \)
- Polygon = \( x[i], y[i]; \)
End

4. Location of Research and Data Analysis
4.1 Research facility
The location of the study was conducted in Merauke Regency by collecting samples in the rice fields of Tanah Miring, how to collect data and evaluate the design through the Android mobile application along with organized applications. Collect data on the web for information about crop production data. Visualize the growth of food plants. In using this system, the need for professional farmers / instructors from each area of the farmer group in each village using mobile technology that uses Android to process the information contained in the system, such as inputting farmers / extensions. Entering plant data Tracking land data and calculating space using Drone devices via satellite data and Drone results. The data is then stored in a database server via JSON and PHP Web Service formats as servers for data processing such as imported plant types. Grain classification Each region and overall.

4.2 Analysis Data
The results of data analysis will be applied to systems that are intended to search for system weaknesses in order to propose improvements to the system that will be developed. System design is the process of designing a system to be created. In the system that will generate the input data will be in the form of seed specification area and processed to calculate the estimated food production by using the Google Maps feature, processed with Eclipse, which will be displayed in the form of an app. Mobile apps Creating database designs Encryption and use of system design in the program code The system is made using PHP and Java programming language, system results in the form of information about the amount of output over a period of time via the web and mobile. System testing is the process of implementing the system and testing whether the system meets the desired goal or not.
5. Conclusion

Based on this study, the government is easy to monitor the development of food crops in each region by using technology that is operated via online and mobile phones on Android, which is supported by aerial photography via drones. For this reason, the government has helped farmers to grow food crops easily. In addition, food plant production can increase during planting and reduce the rate of rebuilding of food plant production can be arranged from each region.

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