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Analysis of Paddy Zakat using Graphic User Interface MATLAB (A Case Study: Paddy Farm in Tumpatan Village, Deli Serdang)

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ABSTRACT

Paddy zakat is usually calculated manually, or at the most least with the use of a calculator. Such computations are sluggish, have a very plain look, and cannot be employed in big quantities. Even more accurate paddy zakat calculations may be made with the Graphic User Interface (GUI) of MATLAB. The rate of paddy zakat, the percentage of zakat given by the Minister of Religion of the Republic of Indonesia, and the price of paddy per kilogram produced in one formula are the basis for calculating paddy zakat using the GUI MATLAB. Using the GUI MATLAB, a case study of calculating rice zakat was conducted on a farm in Tumpatan Village, Deli Serdang. The data included in the case study included the size of paddy fields, the paddy production area, and the price of paddy per kilogram during the paddy harvest. The study's findings demonstrate how useful the MATLAB GUI is for calculating paddy zakat and how it can be used to present a graph of the required amount of zakat based on paddy yield. The amount of paddy zakat that a farmer must pay increases with the paddy harvest income and paddy price per kilogram.

1. Introduction

Humans have been involved in agriculture from prehistoric times. First, farming by cultivating specific land parcels of fertile land yield enough agricultural output to cover basic needs. The land is abandoned and alternative fertile land is sought after when agricultural revenue drops and there is less fertility on the property.

Nowadays, agricultural land is ceded in large quantities using cutting-edge technology, which leads to an abundance of agricultural output. The farm must pay zakat when there is plentiful agriculture and a suitable zakat rate. Zakat is a close bond with other humans as well as an act of devotion dedicated to Allah. In Surah At-Taubah Verse 103 of the Koran, Allah establishes the mandate for performing zakat [1]. This means:

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> "With the zakat you take from some of their riches, you purify and clean them, and you pray for brand. It is, in fact, your prayer that they find comfort in. And Allah is All-Powerful, Sensing, and Perceiving."

There are several opinions of scholars regarding the types of plants that are mandatory to pay the zakat [2], namely:

i. The first opinion: The opinions expressed by Salaf academics, including Ibn Al Mubarak, Hasan Al-Basri, Ibn Sirin, Abu 'Ubaid, and Ibn Talha. They believe that only four categories—grains and fruit—are required to pay agricultural zakat. Dates, barley, wheat, and grapes are these four varieties [3].
ii. The second opinion: Imams Malik and Syafii's opinion. They think that because agricultural zakat is required, staple foods may be kept fresh for a long time. This fundamental diet of maize, wheat, barley, and paddy is the primary diet consumed by a people in a particular location. According to Imam Maliki and Imam Syafii, zakat is not required for fruit (except from dates and grapes) or grains (apart from those that are basic foods) [4,5].
iii. The third opinion: Imam Ahmad's opinion Bin Hanbal is of the opinion that agricultural products that must be given zakat are grains and fruits can be dried, stored for a long time and liked. He makes no distinction what are the agricultural products as staple food or not [6].
iv. The fourth opinion: The opinion of Imam Abu Hanifah, who holds that zakat is required for all agricultural products—planted or grown—as long as they are beneficial to humans and do not count as much or any agricultural production at all [3].
v. The fifth opinion: Yusuf Al Qaradawi's opinion, which has opinions of all types agricultural crops that can provide wealth with conditions if the zakat rate is sufficient, zakat is obligatory [3].

Agricultural zakat studies have been carried out by researchers including Ab Rahman *et al.,* [2] who examine agricultural zakat in context Malaysia states that agricultural products in the form of grains which are commonly given zakat on Malaysia is paddy only. The previous research strengthening agricultural zakat in Malaysia shows the benefit of humanity especially to strengthen the pillars economy in Malaysia [7-10]. Research result provide some rules which can strengthen the economy through agricultural zakat, namely by increase agricultural land, adjust zakat rate level for each province and by carrying out assessments on plants and zakat to tenant's land or the main owner of agricultural land.

The economic calculation of zakat and agricultural zakat calculation model has been conducted previously in Cileunyi District, Regency Bandung [11]. This research is a field study in the form of descriptive qualitative data primary data obtained from interviews and data secondary obtained from literature review.

The analytical analysis in-depth calculation of agricultural zakat was studied by Abdullah [12] in Kuta Makmur District, Northern Aceh. This research is field research in the form of descriptive-inductive qualitative. Primary data obtained through interviews while data secondary data obtained through literature review.

The study of agricultural zakat based on the decision tree method using software application was applied by Widya [13]. The software application based on GUI, but it is an existing GUI for interface input data and calculation of the agricultural zakat. The user just uses the GUI and cannot modify the interface. This paper discusses method of zakat calculation for paddy production using the GUI MATLAB. A case study on a paddy farm was conducted in Tumpatan Village, Deli Serdang, using a large amount of data from the paddy field, paddy price per kg, and paddy yields in kilogram per hectare. These are the necessary data to input the computation into a GUI MATLAB application.

2. Methodology

This study approach involves utilizing the GUI MATLAB application to retrieve the data needed to calculate the paddy zakat. Where is the data found from someone who manages the paddy field. Extensive paddy fields in ranted, paddy harvest per hectare in kg, and paddy price per kg in rupiah are the necessary statistics. This study approach explains the formula for determining the paddy zakat when the rate is sufficient where a detailed explanation of the paddy zakat rates is provided for both grain and rice forms.

Graphic User Interface (GUI) MATLAB used to calculate the paddy zakat issued by a farmer. The steps for creating the GUI are explained in this research method.

2.1 Information about Paddy Price and Harvest Production

The paddy field in Tumpatan Village, Deli Serdang, served as the case study for this study. Interview with a farmer was conducted as part of this study to get the information needed to calculate paddy zakat. Mr. Nasution, who oversees the paddy fields in Tumpatan Village, was interviewed. The paddy fields are shown in Figure 1 [14]. Therefore, interviewing him is a highly appropriate way to retrieve the data needed for this research.

Fig. 1. Location of Tumpatan village, Deli Serdang

The paddy fields planted with rice by Mr. Nasution works with irrigation or self-watering, namely with make a drilled well and withdraw or spilling water from the ditch around the paddy fields. Meanwhile, the work starts from processing soil, rice planting, spraying so that rice harvesting is done with hire people. The information data on paddy field area, yield harvest and price of paddy obtained from Mr. Nasution as in Table 1. This data is used to calculate how much paddy zakat is issued by Mr. Nasution as a result of the paddy harvest.

Table 1
Paddy field area, harvest yield and paddy price

Paddy field area (hectare)	Harvest yield per hectare (kg)		Paddy price per kg (Rp)	
	Minimum	Maximum	Minimum	Maximum
6	5,000	6,000	4,300	4,800

2.2 Formulation for Calculating the Paddy Zakat

There are two categories for the required proportion of zakat farmers' expenses related to paddy field maintenance and irrigation. The first kind consists of paddy fields that are irrigated or fed by rain, and the management receives little compensation. If there are no expenditures, thus the payment of zakat should be 10% of the paddy's price. The second type of paddy fields is those that are irrigated on their own with a water pump. The water pump is used to process paddy fields till harvest, utilizing water from nearby rivers or drilled wells. In case of high expenses, zakat on paddy is levied at a rate of 5% [15] and it should be distributed to Asnaf [16,17].

The Republic of Indonesia's Ministry of Religion [18] said that the zakat rate for paddy every harvest is 1,350 kg for grain and 750 kg for rice, with the zakat percentage being the same as that reported by Muhammad Ali [15]. When the paddy zakat rate is reached by a farmer and the price of paddy in form grain or rice is known, then the zakat is large paddy that must be expended by person farmers are in accordance with equation (1) and (2). These two equations are used to calculate zakat of paddy with using the GUI MATLAB.

$$Zg = Percentage\ x\ Wg\ x\ Pg \tag{1}$$

$$Zr = Percentage\ x\ Wr\ x\ Pr \tag{2}$$

where:

Z_g = Paddy zakat in form grain (Rp)
Z_r = Paddy zakat in form rice (Rp)
W_g = Paddy weight in form grain (kg)
W_r = Paddy weight in form rice (kg)
P_g = Paddy price in form grain (Rp/kg)
P_r = Paddy price in form rice (Rp/kg)

2.3 Graphic User Interface MATLAB

The overall layout of the MATLAB GUI is shown in Figure 2, where it is divided into four sections:

i. Author's statement text
ii. Calculation of paddy zakat
iii. Text containing required or optional information about zakat
iv. Create a graph that shows the harvest limitations
v. Graphic display

The text of the author's statement is indicated in Figure 3. This text only provides author affiliation information. This text is formed from static text from the GUI MATLAB component. This text will appear in the GUI display corresponds to the original when executed.

The part of the paddy zakat calculation design, as seen in Figure 4, is utilized to determine how much mandatory zakat must be supplied by a farmer when paddy harvesting rates are sufficient. The paddy zakat calculation panel contains the whole Push Button, together with the Static Text, Edit Text, and Pop-up components that make up this part.

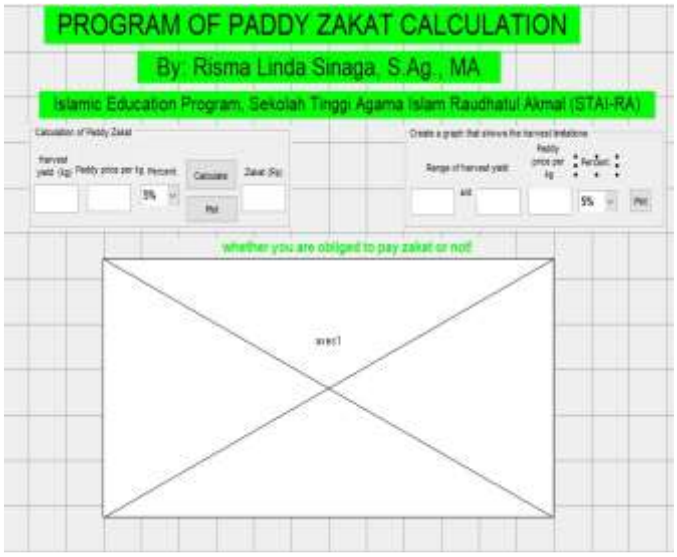


Fig. 2. Design of GUI MATLAB

Fig. 3. The text of the author's statement

Fig. 4. Paddy zakat calculation panel

Fig. 5. Display of a decision to pay zakat or not

```
function berat_Callback(hObject, eventdata, handles)
% hObject    handle to berat (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
al=str2num(get(handles.berat,'string'))
if al>= 1350
    str=sprintf('You Must Pay Zakat')
    set(handles.text15,'string',str)
    else
    al< 1350
        str=sprintf('You Are Not Obligated to Pay Zakat')
    set(handles.text15,'string',str)
end
```

Fig. 6. Code program to take a decision that a farmer is obligated to pay zakat or not

```
% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
brt=str2num(get(handles.berat,'string'));
hrg=str2num(get(handles.harga,'string'));
prs=get(handles.persen,'value');
if (prs==1);
zkt=brt*hrg*0.05;
set(handles.zakat,'string',zkt)
else
    zkt=brt*hrg*0.1;
set(handles.zakat,'string',zkt)
end
```

Fig. 7. Code program to calculate the paddy zakat

```
% --- Executes on button press in plot.
function plot_Callback(hObject, eventdata, handles)
% hObject    handle to plot (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
prs=get(handles.persen,'value');
if (prs==1);
brt=str2num(get(handles.berat,'string'));
hrg=str2num(get(handles.harga,'string'));
axes(handles.axes1)
zkt=brt*hrg*0.05;
bar(zkt)
set(gca, 'XTickLabel', {brt})
xlabel('Paddy weight (kg)')
ylabel('Zakat (Rp)')
grid on
else
brt=str2num(get(handles.berat,'string'));
hrg=str2num(get(handles.harga,'string'));
axes(handles.axes1)
zkt=brt*hrg*0.1;
bar(zkt)
set(gca, 'XTickLabel', {brt})
xlabel('Paddy weight (kg)')
ylabel('Zakat (Rp)')
grid on
end
```

Fig. 8. Code program to display bar graph

The weight of the rice harvested in a single harvest is listed in the Edit Text column "Harvest yield (kg)" in Figure 4. Once completed, a decision about individual farmers' obligation to pay zakat will be displayed, as depicted in Figure 5. According to the zakat rate for paddy in the form of grain set by the Indonesian Ministry of Religion, it is 1,350 kg and above. If Edit Text is set to 1,350 and above, then the text in Figure 5 it changes to "You Must Pay Zakat". If Edit Text is left aside smaller

than 1,350, then the text in Fig 5 changed to "You Are Not Obligated to Pay Zakat". To be able to form a text display like this, a program code is created like Figure 6.

In the Edit Text column "Paddy price per kg" and "Percent" Pop-up Figure 4 each filled with the price of paddy and percent corresponding to the price walking and types of paddy fields. There are "Calculate" and "Plot" buttons in Figure 4. The "Calculate" button is used to calculate the amount of paddy zakat which must be issued using equation (1). To provide the results displayed in the Edit Text Zakat (Rp) column, this must be created program code as in Figure 7. While the "Plot" button is for creating a bar graph according to the graph axis Figure 2 that must be coded program as shown in Figure 8.

In order to show a graph of the zakat that farmer must pay if the rate is adequate, with a minimum limit and the maximum weight of rice that a farmer may harvest, the section builds a graph with harvest yield restrictions similar to Figure 9. As seen in Figure 10, a software code is generated in order to display the graph.

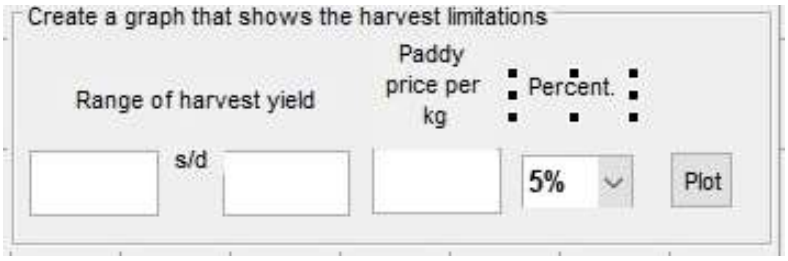


Fig. 9. Create a graph that shows the harvest limitations

```
function pushbutton3_Callback(hObject, eventdata, handles)
prs1=get(handles.persen1,'value');
if (prs1==1);
brt1=str2num(get(handles.berat1,'string'));
brt2=str2num(get(handles.berat2,'string'));
hrg1=str2num(get(handles.harga1,'string'));
axes(handles.axes1);
brtt=brt1:50:brt2;
zkt1=brtt*hrg1*0.05;
plot(brtt,zkt1,'-d','LineWidth',2);
xlabel('Paddy weight (kg)')
ylabel('Zakat (Rp)')
grid on
else
brt1=str2num(get(handles.berat1,'string'));
brt2=str2num(get(handles.berat2,'string'));
hrg1=str2num(get(handles.harga1,'string'));
axes(handles.axes1);
brtt=brt1:50:brt2;
zkt1=brtt*hrg1*0.01;
plot(brtt,zkt1,'-d','LineWidth',2);
xlabel('Paddy weight (kg)')
ylabel('Zakat (Rp)')
grid on
end
```

Fig. 10. Code program to create a graph that shows the harvest limitations

3. Results and Discussion

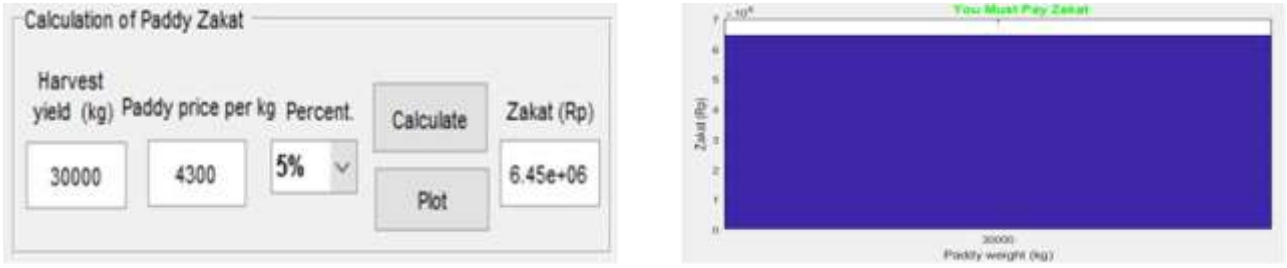
With the use of the GUI MATLAB, a case study on the computation of rice zakat in the form of grain was conducted using the paddy crop of Mr. Nasution, which spans 6 hectares and has a

minimum income of 5,000 kg and a maximum income of 6,000 kg per hectare. Additionally, the minimum and maximum prices for paddy per kilogram are Rp 4,300 and Rp 4,800. This computation was based on one paddy for planting and harvesting. Paddy zakat calculation models may be represented in six ways from here, specifically:

i. Model 1: Minimum paddy income and minimum price
ii. Model 2: Minimum paddy income and maximum price
iii. Model 3: Maximum paddy income and minimum price
iv. Model 4: Maximum paddy income and maximum price
v. Model 5: Paddy income limits minimum-maximum and minimum price
vi. Model 6: Paddy income limits minimum-maximum and maximum price

3.1 Minimum Paddy Income and Minimum Price

What is indicated by the minimum paddy income is 6 hectares x 5,000 kg/hectare = 30,000 kg. Moreover, Rp 4,300/kg is the minimum price of paddy that is mentioned. 5% of the amount charged is Zakat. After that, the data is integrated into the GUI MATLAB, which shows the findings and a bar graph like the one in Figure 11. According to Figure 11, Rp 6,450,000 is the required amount of paddy zakat in the form of grain for model 1.

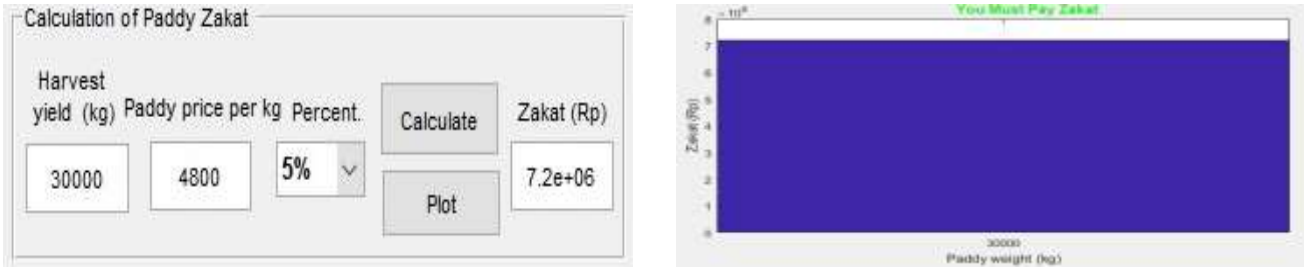


(a) (b)

Fig. 11. Findings of model 1 (a) Calculation of paddy zakat (b) Bar graph for zakat

3.2 Minimum Paddy Income and Maximum Price

The maximum paddy price referred to is Rp 4,800/kg. Then this data is entered into the GUI MATLAB which provides a display of the results and a bar graph as in Figure 12. As depicted in Figure 12, model 2 requires payment of Rp 7,200,000 in the form of grain for paddy zakat.

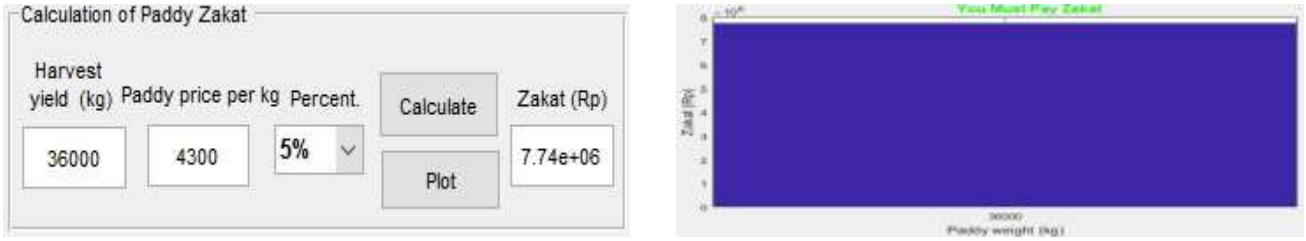


(a) (b)

Fig. 12. Findings of model 2 (a) Calculation of paddy zakat (b) Bar graph for zakat

3.3 Maximum Paddy Income and Minimum Price

What is meant by maximum paddy income is 6 hectares x 6,000 kg/hectare, or 36,000 kg. After that, the data is entered into the MATLAB GUI, which offers a bar graph similar to Figure 13 and a results display. According to Figure 13, Rp 7,740,000 is the required amount of paddy zakat in the form of grain for model 3.

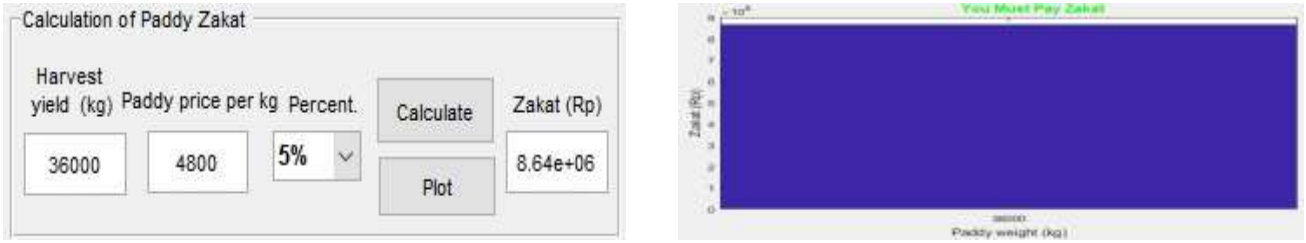


(a) (b)

Fig. 13. Findings of model 3 (a) Calculation of paddy zakat (b) Bar graph for zakat

3.4 Maximum Paddy Income and Maximum Price

The maximum price and paddy revenue data are loaded into the MATLAB GUI, which displays the results and bar graph shown in Figure 14. As depicted in Figure 14, model 4 requires payment of Rp 8,640,000 in the form of grain for paddy zakat.



(a) (b)

Fig. 13. Findings of model 4 (a) Calculation of paddy zakat (b) Bar graph for zakat

3.5 Paddy Income Limits Minimum-Maximum and Minimum Price

The limits on paddy income that are being discussed pertain to the range of 30,000 kg to 36,000 kg. The required quantity of paddy zakat granted is shown on a graph using this data, which is loaded into the MATLAB GUI (Figure 15). According to Figure 15, the amount of paddy zakat that must be paid with the model 5 is between Rp 6,450,000 and Rp 7,740,000 in the form of grain.

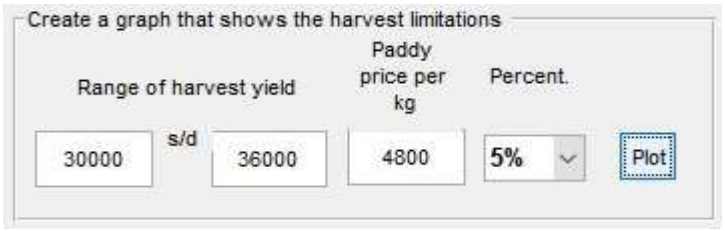
(a)

(b)

Fig. 15. Amount of paddy zakat should be paid for model 5 (a) Input data for paddy zakat (b) Graph of paddy zakat

3.6 Paddy Income Limits Minimum-Maximum and Maximum Price

These maximum and minimum prices as well as the restrictions on paddy income were entered into the MATLAB GUI to create a sizable graph of the mandatory zakat on paddy issued, as shown in Figure 16. According to Figure 16, when using Model 6, the required quantity of paddy zakat in the form of grain is between Rp 7,200,000 and Rp 8,640,000.



(a)

(b)

Fig. 16. Amount of paddy zakat should be paid for model 6 (a) Input data for paddy zakat (b) Graph of paddy zakat

4. Conclusions

A case study on agriculture in Tumpatan Village, Deli Serdang, was used to construct the GUI MATLAB, which assists in the calculation of paddy zakat. There are six models in the calculation, the first model is minimum paddy income and minimum price, the second model is minimum paddy income and maximum price, the third model is maximum paddy income and minimum price, the fourth model is maximum paddy income and maximum price, the fifth model is paddy income limits minimum-maximum and minimum price and the last model in paddy income limits minimum-maximum and maximum price.

The case study is applied at the paddy fields planted with rice by Mr. Nasution works with irrigation or self-watering, namely with make a drilled well and withdraw or spilling water from the ditch around the paddy fields. His paddy area is 6 hectares, minimum and maximum harvest yield per hectare are 5,000 kg and 6,000 kg with minimum and maximum paddy price per kg are Rp 4,300 and Rp 4,800, respectively. By following Indonesian Ministry of Religion's grain or paddy rate and applying the GUI MATLAB design, thus it can be stated that the amount of paddy zakat that must be paid in rupiah will increase in proportion to the paddy income received from the paddy zakat rate and the price of paddy per kilogram.

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