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## Identification and Analysis of Forest Functions/Trees in Reducing Wind Speed on Forests Around Unima as a Explorative Learning Reference

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### Abstract

*The purpose of this research is to find out the types of trees that can reduce wind speeds well in forests in the forest area around Manado State University and explore scientific concepts and processes that will be used as a reference in explorative learning processes. This research is a type of exploratory research. The method used in this study is qualitative. The object of this research is a tree species that can reduce wind speed well in the forest area around Unima. Based on the results of research that has been done to find out trees that are able to reduce wind speed well in the forest area in front of the workshop and in the area around the Faculty of Engineering, trees that are able to reduce wind speed well are Kiacret/rain tree species (*Spathodea campanulate*). After knowing a tree that is able to reduce wind speed well, then the concept of science and scientific processes are formulated based on facts or phenomena about trees that can reduce the wind speed in the form of a matrix that will be used as a reference in explorative learning.*

**Keywords:** tree species, forest function, wind reduction, exploratory research.

### INTRODUCTION

Forest is one of the sources of life that keep the earth is for the sake of the course of the life of man on earth is, the forest is also a lung world with various types of plants in the inside of her that maintaining the availability of oxygen still exist on earth is and absorb carbon dioxide . Forest also includes areas in which overgrown by trees large as the spot the course of every process of life . In addition to the tree are also many common herbs small others are there in the woods and forests are home to species of animals that occupy every region in it and the function of the forest is as the lungs of the earth , which we know that the forests are still there are many plants that provide air for creatures alive and forests are also able to reduce wind tight or wind storms ( Rivilino , 2010).

Meoliono , (2008 ) explains that in a dictionary big Indonesian tree means the plants are trunked loud and large . Embo, (2015 ) explains that the tree as a constituent main area of forest plays an important in setting water system, backup plasma germ , support life , and the source of power development .

Based on the results of the observation that in doing in the woods around the Manado State University (UNIMA) there are several types of trees that can reduce the speed of the wind as for example a tree "spathodea/tree rain ( *Spathodea campanulata* )" tree this has a power hold that strong and not easily broken and the condition of the tree is lush . According to Pearl, (2008 ) the wind is air movement that occurs on the surface of the earth . The wind was blowing from where pressurized air high place of pressurized air low , so it can affect the speed of the wind . When the wind blew the tree that has the structure of the physical that is dense , has a trunk , branches and twigs that strong would be able to reduce the speed of the wind with good , while the structure of the physical tree that is not dense, has a trunk, branches and twigs that are not strong then the

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tree that will be weak in reduce wind speed. Wind has a function as a process of nature to help the plants in the process of pollination because when the wind hit the trees around the forest then it will cause the tree that sways so that the process of pollination that can take place. (Results of observation 13 January 2019).

When this many educators are still less take advantage of the natural surrounding as a matter of learning and lifting concepts of science to be used as an ingredient of learning in creating a design study . In case this an educator can use the natural surrounding as a matter of learning and using the natural surrounding as a place of learning so that the participant students can more easily in learning and more spacious understanding about science .

## **RESEARCH METHODS**

Methods of research are used in research this is research Explorative. According Fathoni , (2005) research explorative is a study that intends to conduct exploratory or introduction of the specific symptoms.

### **1. Data Collection Techniques and Instruments**

Mechanical collection of data is done by way of observation and documentation then Instruments in research this is by using a sheet of observation and pieces of documentation .

### **2. Data Analysis Techniques**

Mechanical analysis of the data used in the study is that the analysis of qualitative , include :

1. Presentation of data in a graph and meaning to explain the phenomenon/process of trees in reducing wind speed
2. Determine the type of tree in reducing wind speed on land 1-2
3. Comparing graph velocity winds linear and speed round the propeller bamboo land 1-2 and interpret the differences associated with the condition of the land .

## **RESULTS AND DISCUSSION**

Manado State University (UNIMA) is one of the University of the State that there is in the province of North Sulawesi, in addition to the University of Sam Ratulangi (UNSRAT). Manado State University is located in the area of mountainous district of Minahasa , 800 m from the surface of the sea and within less over 40 km from the city of Manado. University area of 270 ha, located in areas with temperatures were rather cool about 24/27 °C on during the day and can reach 18 °C at night day.

This research was conducted in two forest areas around the campus of Manado State University , namely in the forest area around the Faculty of Engineering and the front forest area of the Workshop on June 20 , 2019 to June 28, 2019. This research was obtained by observation and documentation techniques . Retrieval of data is directly on the temperature of the air , the speed of the wind linear and speed round the propeller bamboo to identify and analysis of tree in reducing the wind .

### **Explore Science Concepts and Processes**

#### **1. Viewing Details phenomenon Components that terinteraksi Affect phenomenon**

There are two fields that used by researcher as a research place namely land 1 in the area of forest dep an Workshop and land 2 in the area of forest around Fatek . In the land that is the first area of woods next workshop condition of forests n yes not too skewed, there are a variety of species of trees and plants closing the land , and also has not used land agriculture and development . While in the area of forest that both are in

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around Fatek condition the land was highly skewed, only there is little species of trees and vegetation cover land and not be used as a land of agriculture and construction .

**2. Identifying Variables that Affect Phenomena and Relationships between Variables Based on Concepts and Science Processes**

In research it which became the object of research is a kind of tree . Results of identification that do research on the two lands are terdapaat some trees are able to reduce the speed of the wind with good .

**3. Take Measurements in the Field of Variables**

At this stage the researcher took measurements in two areas, namely in the forest area in front of the Workshop and in the forest area around Fatek by using the size of the outermost area, 15 meters inside and 30 meters inside .

In the study 's researchers used four instruments measuring is a tool measuring the speed of wind linear, the temperature of the air by using the tool Digital Instruments LM-8000, means of measuring the speed of wind traditional by using the tool blades of bamboo, stopwatch to measure the time and the meter to measure the broad area will be in use .

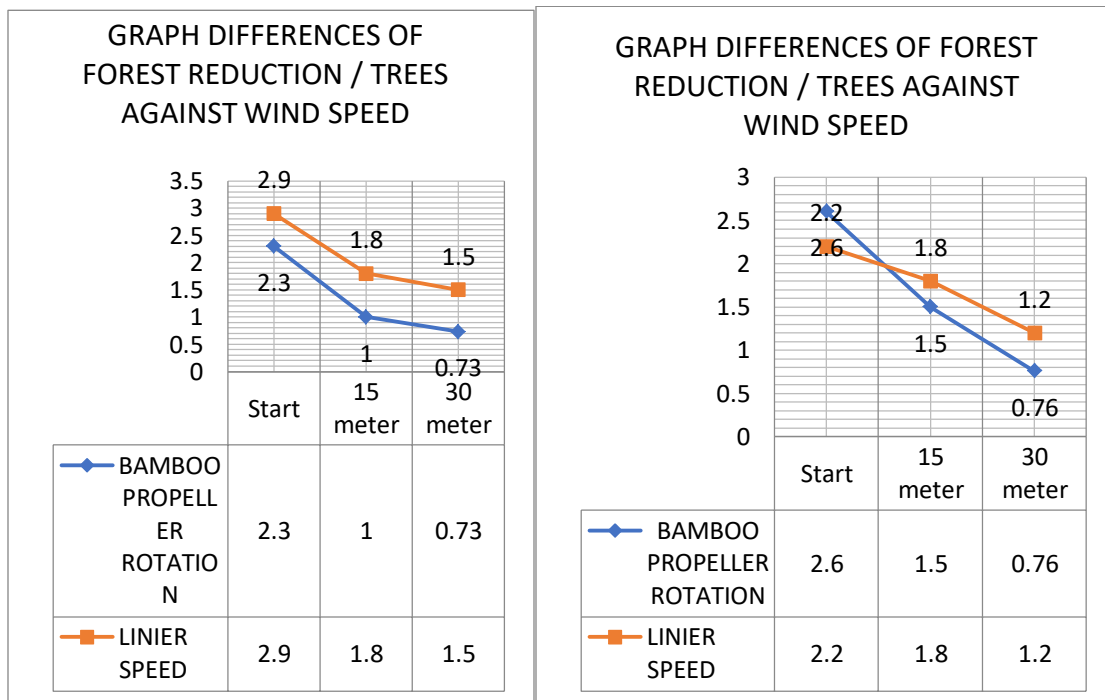


Figure 1. Graph in the Forest Front Area of the Workshop

Figure 2. Graph in the Forest Area Around Fatek ( Faculty of Engineering)

So of 8 species of trees that observed in the area of forest the next workshop and 10 species of trees in the area of forest around Fatek not all trees can reduce wind but only a few trees alone that can reduce speed of the wind with good, because not all trees were observed to have the characteristics of the structure of the physical plant that is capable of reducing to velocity winds with good. Here researcher do observation at 4 models of trees that will be in observed that tree tall leafy, tree height is not lush, tree short- lush and tree short is not lush . Of the four models of tree only trees that have structures are at physically the lush, trunk, branches, and twigs are strong and the leaves are lush are able to reduce the speed of the wind with good .

#### 4. Conduct Data Analysis and Interpret Processes that occur in Trees in Reducing Wind Speed

Land first and second were used in the study is located in the woods next Workshop and forests around Fatek which the land is quite spacious . Because it is necessary measurement superior location with a spacious size of  $30 \times 25 M^2$ . In the area of forest the next workshop is contained 8 trees including 3 tree short is not lush, 1 tree short- thick, three trees tall lush, 1 tree height is not lush. Based on the results of the observations were carried out to know the trees were able to reduce the speed of the wind with a well in the woods next workshop is seen from the structure of the physical tree. So from the results of observations that can be a tree that can reduce the speed of the wind is a tree tall lush.

Land both in research is located on part of the forest at around Faculty of Engineering in the area of forest is there are 10 trees including two tree short is not lush, 1 tree short- thick, three trees tall leafy, 4 tree height is not lush.

Based on the results of identification that has been done at the location 1 and location 2 it can be determined that the model tree that can reduce the speed of the wind with good are trees tall lush that tree spathodea/tree rain (*Spathodea Campanulata* ). In discussing a region called Spatudi or spathodea . Trees n so many branches to form the leaves rounded elongated . Trees *Spathodea campanulate* can continue to grow with good until reaching a height of 10 to 35 meters. Trees have have flowers colored red large hermaphrodite and orange on parts inside. When the buds, flowers curved and containing gum colored red. Stalk leaf n ya short with a thickness of about 0.7 cm. equipped also with lenti cells were striking at rachisnya for history itself, the plant *Spathodea campanulata* is given a name by Fuchs in the year 1542. Campanulata itself has meaning plants with crown rounded and base are spacious bleak arc sound bells church. *Spathodea campanulata* plants can live well in all kinds of soil at an altitude of 100-1000 m.



#### 5. Formulate Concepts and Networks of Science Process Concepts Based on Data Analysis and Reference Results

After knowing the trees were able to reduce the speed of the wind with good , then the next will be in formulating the concept of science and the process of science is based on facts or phenomena of the tree in reducing the speed of the wind that exist in each area on the table matrix . Facts/phenomena in the set of the object of research is a tree that is capable of reducing the speed of the wind at each location and researchers determine the variables that affect poh on can reduce the speed of an gin with good. From the facts/phenomena and the variables that are already in specified further in the exploration into the concepts of science and the process of science. The results of the exploration of concepts and processes of science later in the analysis synthesis through measurement/observation and analiss reference in the form of a book , the results of research in tian/journals and sources are linked. From the table matrix that is already filled complete will be in made in the form of matter that subsequently can be used as a reference of learning explorative . The material can be seen in Table 6.



Table 6. Table Matrix Design Science Concept.

Facts / Phenomenon	Variable	Exploration of Science Concepts and Processes				Synthesis Analysis
		Science concept			Science process	
		Physics	Chemistry	Biology		
Trees spathodea / tree rain ( <i>spathodea campanulata</i> ) Tree swing range is not too swaying	1. Wind 2. Rain Tree ( <i>Spatodea campanulata</i> )	Speed Photosynthesis	1. H <sub>2</sub> O 2. CO <sub>2</sub> 3. Nitrogen 4. Oxygen (O <sub>2</sub> ) 5. Photosynthesis	1. The physical structure of plants is <i>spatodea</i>	temperature can make the air moist , so that it can affect wind	<p>•Speed Formula</p> $v = \frac{Distance}{time}$ <p>= m/s</p>


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	<p>3. Air temperature</p>			<p><i>campanulata</i> 2. Classification of <i>spatodea campanulata</i> plants 3. The breeding of SS <i>spatodea campanulata</i> plants 4. Photosynthesis</p>	<p>speed . Trees Rain (<i>spatodea campanulata</i>) has the structure of the physical are high dense , has a trunk , branches and twigs that strong so it is able to reduce the speed of the wind with good</p>	<p>•<b>H<sub>2</sub>O</b> 2 H atoms and 1 O atom <math>2H_2 + O_2 \rightarrow 2H_2O</math> •<b>CO<sub>2</sub></b> 1 H atom and 2 O atoms <math>C + O_2 \rightarrow CO_2</math> •<b>Photosynthesis</b> <math>6CO_2 + H_2O \rightarrow C_6H_{12}O_6 + 6O_2</math> Carbon dioxide + water <math>\frac{\text{sun}}{\text{enzymes}}</math> Carbohydrates + Oxygen</p>
<p><i>Albizia</i> Tree (<i>Albizia julibrissin</i>) The swaying range of the tree sways the cock</p> 	<p>1. Wind 2. <i>Albizia</i> Tree (<i>Albizia julibrissin</i>) 3. Air temperature</p>	<p>Speed Photosynthesis</p>	<p>1. H<sub>2</sub>O 2. CO<sub>2</sub> 3. Nitrogen (O<sub>2</sub>) 4. Oxygen 5. Photosynthesis</p>	<p>1. The physical structure of the <i>Albizia julibrissin</i> plant 2. <i>Albizia julibrissin</i> plant classification 3. The development of the <i>Albizia julibrissin</i> plant 4. Photosynthesis</p>	<p>temperature can make the air moist , so that it can affect wind speed . Tree <i>Albizia</i> (<i>Albizia julibrissin</i>) has a structure physically that short is not dense , has stems , branches and twigs that are small so that they are unable to reduce the speed than wind with good</p>	<p>•<b>Speed Formula</b> <math display="block">v = \frac{W}{s} = \frac{\text{Distance}}{\text{time}} = m/s</math> •<b>H<sub>2</sub>O</b> 2 H atoms and 1 O atom <math>2H_2 + O_2 \rightarrow 2H_2O</math> •<b>CO<sub>2</sub></b> 1 H atom and 2 O atoms <math>C + O_2 \rightarrow CO_2</math> •<b>Photosynthesis</b> <math>6CO_2 + H_2O \rightarrow C_6H_{12}O_6 + 6O_2</math> Carbon dioxide + water <math>\frac{\text{sun}}{\text{enzymes}}</math> Carbohydrates + Oxygen</p>
<p>Bringin Tree (<i>Picus Annulata</i>) Tree swing range is not too swaying .</p>	<p>1. Wind 2. Bringin Tree (<i>Picus Annulata</i>) 3. Air temperature</p>	<p>Speed Photosynthesis</p>	<p>1. H<sub>2</sub>O 2. CO<sub>2</sub> 3. Nitrogen (O<sub>2</sub>) 4. Oxygen 5. Photosynthesis</p>	<p>1. The physical structure of the <i>Picus Annulata</i> plant</p>	<p>temperature can make the air moist , so that it can affect wind</p>	<p>•<b>Speed Formula</b> <math display="block">v = \frac{W}{s} = \frac{\text{Distance}}{\text{time}} = m/s</math></p>


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	e			<p>2. Classification of plants <i>Picus Annulata</i></p> <p>3. The breeding of the <i>Picus Annulata</i> plant</p> <p>4. Photosynthesis</p>	<p>speed . Trees Bringin (<i>Picus annulata</i>) has the structure of the physical are high dense , has a trunk , branches and twigs that strong so it is able to reduce the speed of the wind with good</p>	<p>•<b>H<sub>2</sub>O</b> 2 H atoms and 1 O atom <math>2H_2 + O_2 \rightarrow 2H_2O</math></p> <p>•<b>CO<sub>2</sub></b> 1 H atom and 2 O atoms <math>C + O_2 \rightarrow CO_2</math></p> <p>•<b>Photosynthesis</b> <math>6CO_2 + H_2O \rightarrow C_6H_{12}O_6 + 6O_2</math> Carbon dioxide + water <i>sun</i> <i>chlorophil</i></p> <p>Carbohydrates + Oxygen</p>
<p>Enau / Aren Tree (<i>Arenga Pinnata</i>) Tree swing range is not too swaying</p> 	<p>1. Wind 2. Enau / Aren Tree (<i>Arenga Pinnata</i>) 3. Air temperature</p>	<p>Speed Photosynthesis</p>	<p>1. H<sub>2</sub>O 2. CO<sub>2</sub> 3. Nitrogen (O<sub>2</sub>) 4. Oxygen 5. Photosynthesis</p>	<p>1. The physical structure of the <i>Arenga Pinnata</i> plant</p> <p>2. Classification of <i>Arenga Pinnata</i> plants</p> <p>3. Breeding tumbuha <i>Arenga Pinnata</i></p> <p>4. Photosynthesis</p>	<p>temperature can make the air moist , so that it can affect wind speed . Tree of palm / Palm (<i>Arenga Pinnata</i>) has a structure physically that high is not dense , has a trunk and branches are strong so it is able to reduce the speed of the wind with good</p>	<p>•<b>Speed Formula</b> <math display="block">v = \frac{W}{S} = \frac{Distance}{time} = m/s</math></p> <p>•<b>H<sub>2</sub>O</b> 2 H atoms and 1 O atom <math>2H_2 + O_2 \rightarrow 2H_2O</math></p> <p>•<b>CO<sub>2</sub></b> 1 H atom and 2 O atoms <math>C + O_2 \rightarrow CO_2</math></p> <p>•<b>Photosynthesis</b> <math>6CO_2 + H_2O \rightarrow C_6H_{12}O_6 + 6O_2</math> Carbon dioxide + water <i>sun</i> <i>chlorophil</i> Carbohydrates + Oxygen</p>
<p>Trees Bark Forest / Asam Paya (<i>Eleiodeoxa Conferta</i>) Tree swing range is not too swaying</p>	<p>1. Wind 2. Trees Bark Forest / Asam Paya (<i>Eleiodeoxa Conferta</i>)</p>	<p>Speed Photosynthesis</p>	<p>1. H<sub>2</sub>O 2. CO<sub>2</sub> 3. Nitrogen 4. Oxygen (O<sub>2</sub>) 5. Photosynthesis</p>	<p>1. The physical structure of the plant <i>Eleiodeoxa Conferta</i></p> <p>2. Classification</p>	<p>temperature can make the air moist , so that it can affect wind speed . Trees</p>	<p>•<b>Speed Formula</b> <math display="block">v = \frac{W}{S} = \frac{Distance}{time} = m/s</math></p> <p>•<b>H<sub>2</sub>O</b></p>

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	<p>) 3. Air temperature</p>			<p>fication of the plant <i>Eleiodeoxa Conferta</i> 3. Breeding <i>Eleiodeoxa Conferta</i> plants 4. Photosynthesis</p>	<p>Bark Forest / Asam Paya (<i>Eleiodeoxa Conferta</i>) has the structure of the physical are high dense, has a trunk, branches and twigs that strong so it is able to reduce the speed of the wind with good</p>	<p>2 H atoms and 1 O atom <math>2H_2 + O_2 \rightarrow 2H_2O</math> • <math>CO_2</math> 1 H atom and 2 O atoms <math>C + O_2 \rightarrow CO_2</math> • <b>Photosynthesis</b> <math>6CO_2 + H_2O \rightarrow C_6H_{12}O_6 + 6O_2</math> Carbon dioxide + water <u>sun</u> <u>chlorophyl</u> Carbohydrate + Oxygen</p>
<p>Gusts of wind can produce sounds</p>	<p>1. Wind 2. plant</p>	<p>Speed Friction Sound Waves</p>		<p>1. The physical structure of plants</p>	<p>Gusts of wind can generate noise due to the friction that occurs between the plants (leaves and twigs). When the wind blows the plants to be mutual rubbing so that produce sounds propagate through the air, so the more toned wind blows then the sound will be heard more loudly, the structure of the physical plant that mutual friction also affects the plants are</p>	<p>• <b>Speed Formula</b> <math>v = \frac{W}{S}</math> <math>= \frac{Distance}{time}</math> <math>= m/s</math> • <b>Formula - style friction</b> Static force <math>F_s = \mu_s \times N</math> Kinetic style <math>F_k = \mu_k \times N</math> • <b>Formulas wave sound</b> In mathematical rapid propagation of sound <math>v^s = \frac{Distance}{time} = m/s</math>  In Long wave sound <math>V = \lambda \cdot f = m/s</math></p>

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					lush would be hard produce sound because the structure of the tree is much have leaves .	
The wind was not able to be seen as a direct  	1. Wind 2. Smoke	ted	Combustion reaction	Sensory system	When the wind is blowing with speed low , the system senses are not able to feel the gusts of wind in directly . Speed of wind that , can be viewed by using the smoke to see the gusts of wind .	<p>•<b>Speed Formula</b></p> $v = \frac{W}{s} = \frac{Distance}{time} = m/s$ <p>•<b>Combustion reaction</b> Example of a complete combustion reaction :</p> $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$ $C + \frac{1}{2} O_2 \rightarrow CO (a)$ $C + CO_2 \rightarrow 2CO (b)$ $C + H_2O \rightarrow CO + H_2 (c)$

In these research, researchers get 7 facts / phenomena such as :

1. *Trees spathodea / rain ( Spatodea campanulate) range of swing tree not too swayed . has the structure of the physical are high dense , has a trunk , branches and twigs that strong so it is able to reduce the speed of the wind with good*
2. *Tree Albizia ( Albizia julibrissin ) Range of swing tree swaying kechang . has the structure of the physical that short is not dense , has a trunk , branches and twigs are small so it is not able to reduce the speed of the wind with good*
3. *Bringin Tree ( Picus Annulata ) Tree swing range is not too swaying . has the structure of the physical are high dense , has a trunk , branches and twigs that strong so it is able to reduce the speed of the wind with good*
4. *Tree of palm / Palm (Arenga Pinnata ) Range of swing tree not too swayed own trunk and branches are strong so it is able to reduce the speed of the wind with good*
5. *Trees Bark Forest / Asam Paya ( Eleiodeoxa Conferta ) Range of swing tree not too swayed have structures physically that high lush , have stems , branches and twigs that strong so it is able to reduce the speed of the wind with good*
6. *Gusts of wind can generate noise due to the friction that occurs between the plants ( leaves and twigs. When the wind blows the plants to be mutual rubbing so that produce sounds propagate through the air , so the*



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*more toned wind blows then the sound will be heard more loudly , the structure of the physical plant that mutual friction also affects the plants are lush would be hard produce sound because the structure of the tree is much have leaves .*

- 7. The wind was not able to see it directly when the wind is blowing with speed low , the system senses are not able to feel the gusts of wind in directly . Speed of wind that , can be viewed by using the smoke to see the gusts of wind .*

## **CONCLUSION**

- 1. The characteristics of trees were able to reduce the speed of the wind with good is a tree that has a trunk , branches , twigs, which is strong , has a leaf that is green and the roots are strong .*
- 2. the model tree that 'm a mpu reduce the speed of the wind with both the two areas of research that is forest next Workshop and forests around the Faculty of Engineering is a model tree tall lush .*
- 3. Concept and the science that happened on the type of tree that is capable of reducing the speed of the wind with well presented in the form of matrix and the material that d iperoleh can be used as a reference in the process of learning explorative.*

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