DEVELOPING INFORMATION SYSTEM
FOR CLIMATE BASED POTENTIAL AREA ATTACK
OF BROWN PLANT HOPPER (*Nilaparvata lugens*)
IN NORTH COAST OF WEST JAVA

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FOR NATURAL RESOURCE MANAGEMENT
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STATEMENT

I, Erni Susanti, here by stated that this thesis entitled:

Developing Information System for Climate Based Potential Area of Brown Plant Hopper (*Nilaparvata lugens*) in North Coast of West Java

is result of my own work during the period of September 2006 – March 2008, and that it has not been published before. The content of the thesis has been examined by the advising committee and the external examiner.

Bogor, July 2008

Erni Susanti
ABSTRACT

Erni Susanti (2008). Developing Information System for Climate Based Potential Area of Brown Plant Hopper (Nilaparvata lugens) in North Coast of West Java. Under the supervision of Dr. Tania June and Dr Gatot H. Pramono.

Pest infestation is still a big limiting factor for crop production in Indonesia. Although a number of efforts have been made to solve this problem, serious damages caused by pest attacks are still reported from some crop production areas. Among those several pest and diseases, Brown Plant Hopper/BPH (Nilaparvata lugens) is the one that caused severe damage in rice farming. It was recorded on 1998 in West Java that there was 84,976 hectares of rice has been damaged due to BPH and decreased the national rice production as much as 1 percent.

There are some reasons for the increase of crop pest and disease attack i.e.: (1) rice planting season is not at the same schedule, (2) climate anomaly like La-Nina, where on some occasions rainfall occur during dry season. To reduce the worst impact of pest on crop production and productivity, it is needed to have an anticipated efforts and adaptation to climate change. The anticipation strategy and technology deals with adaptation to climate change and the pest attack are aspects that have to be considered in the strategic planning. To support the development of this strategic planning, information system for potential area attack of Brown Plant Hopper (Nilaparvata lugens) is needed.

The objectives of this study are as follows : (1). to study climate parameters that stimulate the BPH attack, (2). to define the relationship between climate parameters and area of BPH attacked, and (3) to build information system of potential area of BPH attack on the paddy field areas. A set of historical climate and area of BPH attack are needed to know the climate parameters are influenced area of BPH attack and to predict future area of BPH attack base on climate prediction. The information system of potential area of BPH attack deals with database, models, and interface that work together over one stand alone application. The potential area of BPH attack can be displayed with spatial distribution.

In the implementation phase, this information system needs future climate data prediction as an input to the model. As a result for prediction potential of area of BPH attack of January 2008, there was area that by prediction was attacked, and it was present in the field. In contrast, there was by prediction was attacked but it was absent in the field. Thus, there are other factors such as rice varieties and planting time that have to be considered in the further model development.
Pest infestation is still a big limiting factor for crop production in Indonesia. Although a number of efforts have been made to solve this problem, serious damages caused by pest attacks are still reported from some crop production areas. Among those several pest and diseases, Brown Plant Hopper/BPH (*Nilaparvata lugens*) is the one that caused severe damage in rice farming. It was recorded on 1998 in West Java that there was 84,976 hectares of rice has been damaged due to BPH and decreased the national rice production as much as 1 percent.

There are some reasons for the increase of crop pest and disease attack i.e.: (1) rice planting season is not at the same schedule, (2) climate anomaly like La-Nina, where on some occasions rainfall occur during dry season, (3) climate (Temperature, relative humidity and photoperiods) significantly effect on live cycle, age and diapausity of insect. Many pest and disease are not dangerous in the past but now became to be warned. Although it is difficult to state that temperature is the most influenced factors, but in fact temperature contributes to the outbreak. To reduce the worth impact of pest on crop production and productivity, it is needed anticipated efforts and adaptation to climate change. The anticipation strategy and technology deals with adaptation to climate change and the pest attack are aspects that have to be considered in the strategic planning. To support the development of this strategic planning, information system for potential area attack of Brown Plant Hopper (*Nilaparvata lugens*) is needed.

The objectives of this study are as follows: (1) to study climate parameters that stimulate the BPH attack, (2) to define the relationship between climate parameters and area of BPH attacked, and (3) to build information system of potential area of BPH attack on the paddy field areas.

A set of historical climate and area of BPH attack are needed to know the climate parameters are influenced area of BPH attack and to predict future area of BPH attack base on climate prediction. Pearson-correlation is used to study climate parameters that stimulate the BPH attack. Stepwise regression is used to define the relationship between climate parameters and area attacked by BPH. The information system of potential area of
BPH attack deals with database, models, and interface that work together over one stand-alone application. The potential area of BPH attack can be displayed with spatial distribution.

Climate parameters may contribute to the area of BPH attack when the climate anomaly occurred (La-Nina). Climate parameters that have significantly correlated with the log of the area of BPH attack, with \( r > \left| -0.4 \right| \) were: rainfall, minimum temperature, minimum temperature lag 1 month, maximum temperature, maximum relative humidity, maximum relative humidity lag 2 weeks, mean relative humidity, and mean relative humidity lag 2 weeks.

The study has come up with the result that multiple regression model that can be used to predict the areas of BPH attack is:

\[
\log_{10} \text{LS} = 10.44 - 0.32 \text{Tmin-2} - 0.00112 \text{CH} + 0.182 \text{Tmax-1} - 0.27\text{Tmin} \quad \text{or} \quad \log_{10} \text{LS} = 11.05 - 0.32 \text{Tmin-2} + 0.209 \text{Tmax-1} - 0.33 \text{Tmin}
\]

with R-square 0.33 meaning that climate factor contributes 33% to the determination of areas of BPH attack. This equation will very useful if the assessment area has available climate data.

The use of information system will help the user to easily obtain the information concerning the observation area of BPH attack and predicting potential area of BPH attack base on climate data prediction, so it can be determined the priority areas for BPH control. Thus the BPH attack can be anticipated and the lost of crops yield can be avoided. GIS application may easily be used for users to obtain information the areas of BPH attack as well as the future prediction of the areas of BPH attack, noted that there is available data of climate prediction. The known potential areas of BPH attack is valuable for designing an early warning system to anticipate the areas of BPH attack, thus the risk of felt harvest can be overcome.

In the implementation phase, this information system needs future climate data prediction as an input to the model. As a result for prediction potential of area of BPH attack of January 2008, there was area that by prediction was attacked, and it was present in the field. In contrast, there was by prediction was attacked but it was absent in the field. Thus, there are other factors such as rice varieties and planting time that have to be considered in the further model development.
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CURRICULUM VITAE

Erni Susanti was born in Sukabumi, West Java Indonesia on May 28th 1965. She was graduated from Bogor Agricultural University, Department of Agrometeorology, Mathematic and Natural Science in 1989. Since November 1989, she is working in Center for Soil and Agroclimate Research (CSAR) and had moved to Indonesian Agroclimate and Hydrology Research Institute (IAHRI) since 2002 till the present. She was enrolled as private student in Master of Science in Information Technology for Natural Resources Management in August 2005. Her final thesis is entitled “Developing Information System for Climate Based Potential Area Attack of Brown Plant Hopper (Nilaparvata lugens) in North Coast of West Java”.